THE

AMERICAN JOURNAL

OF

PHARMACY.

JANUARY, 1841.

ART. LVI.—ON THE HYDRARGYRO-BINIODIDES OF POTASSIUM, THE YELLOW IODIDE OF MERCURY, AND A COMPOUND OF BINIODIDE OF MERCURY AND AMMONIA.

By Ambrose Smith.

A compound of biniodide of mercury and iodide of potassium, was discovered by Bonsdorf, and designated by him, in accordance with his views respecting these and similar combinations, iodo-hydrargyrate of potassium, terminating the electro negative in *ate;* according to Berzelius, whose nomenclature is generally adopted here, it is made to terminate in *ide.* For a more detailed account of these compounds, we are indebted to Polydore Boullay. In a paper addressed to l'Academié des Sciences in Paris, giving an account of a series of mercurial double iodides, in which the iodides of mercury and potassium are included, this able chemist first states in general terms, that, by dissolving as much biniodide of mercury in the saturated solution of the electro-positive iodide as it will take up with the aid of heat, a salt is formed which consists, estimating its composition by the quantity of iodide employed, and of biniodide dissolved, of

One atom of the electro-positive iodide, and
Three atoms biniodide of mercury.

On cooling, the solution deposites one-third of the biniodide of mercury in crystals, and a salt remains in the liquor which may be obtained in crystals by evaporation.

These crystals, in the case of biniodide of mercury and iodide of potassium, resemble crystallized sulphur, and consist of

1 atom iodide of potassium,
2 " biniodide of mercury,
6 " water.

They are decomposed by water, one-half of the biniodide precipitating, and the salt which remains consists of

1 atom iodide of potassium,
1 " biniodide of mercury.

The substance of the above is taken from an abstract of Boullay's paper, published under the authority of l'Acad. des Sciences, in the Journal de Pharmacie, tome 13me, p. 435.

As the results of some experiments I have made on these double iodides lead to somewhat different conclusions, I will present them in detail, premising that M. Boullay's chief object in his paper was to illustrate the theory of electro-chemical combination, by an examination of the double iodides generally, and that his attention does not appear to have been particularly directed to those of biniodide of mercury and iodide of potassium.

1st. To a saturated solution of KI, as much HgI^2 was added as it would dissolve at a boiling temperature, by which a solution was obtained containing

165 parts KI,
385 " HgI^2,

which is a little more than three atoms HgI^2, to four atoms KI. From this solution, on cooling, HgI^2 is rapidly deposited, but if it be boiled nearly to dryness, a yellowish crystalline mass results, containing all the HgI^2.

Thinking a larger portion of HgI^2 might be taken up if it

had been recently precipitated—to a hot solution of KI, $HgCl^2$ was added; the HgI^2 resulting was first precipitated, and then re-dissolved in the liquor. By this means, in a solution of

165 parts KI,
90 " $HgCl^2$

were dissolved. This was as much as could be taken up, as when more $HgCl^2$ was added, it remained unacted upon. It is in the proportion of three atoms KI to one atom $HgCl^2$; as two atoms KI are decomposed by reaction with one atom $HgCl^2$ forming one atom HgI^2 and two atoms KCl, the solution contained

1 atom HgI^2
1 " KI,

together with two atoms KCl.

The double salt, therefore, containing the highest proportion of HgI^2, which I have been able to obtain, consists of HgI^2+KI.

2d. On allowing the hot solution containing 385 parts HgI^2, and 165 parts KI, to cool, 165 parts HgI^2 crystallized from it. The clear liquor was poured off from the free HgI^2, and concentrated by evaporation; on cooling, the double iodide was obtained in long, yellow, flattened prisms, resembling crystallized sulphur. These crystals, by synthesis, are composed of 220 parts HgI^2, and 165 parts KI. They were analysed by heating them in a tube closed at one end, first, gradually to drive off the water of crystallization, and then, with a stronger and carefully regulated heat, in order to sublime the HgI^2, taking care that it should all condense in the upper portion of the tube. When all the biniodide had sublimed, the tube was divided between it and the KI, which remained at the bottom, and the products were carefully weighed. 100 parts of these crystals, by a mean of several analyses thus conducted, are composed of

53.65	parts	HgI^2	which correspond very nearly with	1	atom	HgI^2	454.6
41.85	"	KI		2	"	KI	330.9
4.50	"	HO		4	"	HO	36.
100.00							821.5

It is, then, the di-hydrargyro-biniodide of potassium crystallizing with four atoms of water.

In order to ascertain whether, by the use of alcohol, crystals of the double iodide could be obtained containing a larger proportion of HgI^2, to a saturated solution of KI in this liquid, as much HgI^2 was added as could be dissolved. On evaporating, a considerable portion of HgI^2 was gradually deposited, from which the liquor was poured off when it was sufficiently concentrated. The crystals thus obtained, were orange yellow, becoming orange red on drying, and evidently contaminated with free HgI^2. The proportional result of their analysis was 7 parts, HgI^2, to 5 parts KI, so that it nearly corresponds to the preceding compound.

A salt, however, may be formed, containing nearly one atom, HgI^2, to one atom, KI, by boiling down the hot saturated solution as before stated, but if the temperature is allowed to diminish during the evaporation, a portion of HgI^2 is precipitated.

The di-hydrargyro-biniodide of potassium is decomposed when dropped into water, a portion of HgI^2 being precipitated which may be re-dissolved by agitation, or a gentle heat; and the solution thus formed is not again precipitated by dilution.

If the water is gradually added, so as to make at first a saturated solution, the double salt is dissolved without decomposition.

100 parts of the crystals of HgI^2+2KI, when dropped into water precipitated 13. parts HgI^2. The solution remaining was evaporated to crystallize. Crystals were thus obtained, which by synthesis (with which their analysis corresponded) are composed of $HgI^2+2\frac{1}{2}KI$. These crystals were soluble in water, gradually added, but when dropped into water were decomposed,

a portion of HgI_2 being precipitated as before. The liquor resulting was filtered, and when evaporated to dryness the product was not decomposed by water, but when slowly evaporated, crystals of double iodide were obtained, associated with cubic crystals of free KI.

Solutions were then made containing 1 equiv. HgI^2, to 2½, 3, and 4 equiv. KI. These solutions were concentrated by slow evaporation, and in each case the crystals were associated with cubic crystals of free KI; from these the crystals of the double iodide were separated, in each case were partially decomposed when dropped into water, and on analysis were found to consist of 1 atom HgI^2, with a little more than 2 atoms KI, and about 4 atoms HO.

A double salt was then examined, which had been prepared in considerable quantity, and crystallized by spontaneous evaporation, from a large quantity of mother liquor. It was found to be readily soluble in any proportion of water, without decomposition. This being analysed gave

50.65 parts	HgI^2	nearly	1atom	HgI^2
40.65 "	KI	corresponding	2+"	KI
8.70 "	HO	with	8 "	HO
100.00				

The result of these experiments lead us to conclude that the double salt, containing the largest proportion of KI which can be combined, consists of HgI^2+2KI, that it crystallizes with from 4 to 8 atoms of water of crystallization, that when crystallized with 4 atoms, it dissolves in water, which is gradually added, but is partially decomposed when this is suddenly poured upon it, and that when it contains the larger proportion of water of crystallization, it is dissolved without decomposition in any proportion of water.

To recapitulate the above results, I have been able to obtain two compounds only of biniodide of mercury, and iodide of potassium.

1st. The hydrargyro-biniodide of potassium, HgI^2+KI.

2d. The di-hydrargyro-biniodide of potassium, HgI^2+2KI.

Compounds intermediate in composition may be obtained, by allowing the solution of the former to deposite a portion of its HgI^2, by partial cooling, and evaporating nearly to dryness. These are mixtures in various proportions of HgI^2+KI, and HgI^2+2KI, which crystallize together being apparently isomorphous. My friend Wm. Procter, jr., who has repeated and confirmed the results of most of the preceding experiments, obtained a compound of $2HgI^2+3KI$, in a yellow crystalline mass.

The di-hydrargyro-biniodide of potassium, was introduced to the notice of the medical profession by Dr. Channing, of New York, by a paper published in the Amer. Jour. of Med. Sciences, in the year 1834, since which it has been been considerably used by some physicians in this city, with favorable results. It is no doubt a valuable compound where a soluble persalt of mercury is required, and may be eligibly substituted for the corrosive chloride of mercury, when the administration of an iodide is also indicated.

The ready solubility of the crystals without decomposition seems to depend upon their containing a large proportion of water of crystallization, and this object is best obtained by preparing it in considerable quantity and crystallizing by spontaneous evaporation. When wanted in crystals, it may be prepared by dissolving 1 equiv. biniodide of mercury, in a a strong solution of a little more than 2 equiv. iodide of potassium, filtering the liquor, and evaporating as above indicated. It is usually employed in solution, which may be conveniently made from the proximate elements of the compound.

Take of Biniodide of Mercury,
Iodide of potassium, each, 4 grs.
Water, one fl. oz.
Dissolve and filter the solution.

This is about the strength usually employed here. The dose is from two to six drops, equivalent to from about the thirteenth to the twelfth of a grain of the double salt.

A slight excess of the iodide of potassium is here indicated,

but a very dilute solution of it will scarcely dissolve a larger proportion of the biniodide, and as the iodide of potassium of commerce, is seldom quite pure and dry, it not unfrequently happens that a little more is required.

The double salt, may also be prepared by dissolving one equiv. bi-chloride, or per-nitrate of mercury, in a solution of four equiv. of iodide of potassium, evaporating to dryness and dissolving the double iodide from the hydro-chlorate or nitrate of potassa, by means of alcohol. The process previously indicated is most eligible. When made from the per-nitrate of mercury, it is liable to contain nitre, and as this salt is nearly isomorphous with the double iodide, a considerable portion may crystallize with it without altering materially the appearance of the crystals. It may, however, be detected by its insolubility in strong alcohol.

Composition of the yellow iodide of mercury.—When dissolving biniodide of mercury in a solution of iodide of potassium, a portion of the yellow or the green iodide of mercury, was found to precipitate. This is probably owing to the biniodide gradually loosing iodine on keeping—5 to 10 per cent. was precipitated from some which had been kept some time, while from a portion which had been recently prepared little more than one per cent. was separated.

If the HgI^2 be in excess, the precipitate is the yellow iodide, but if there be a slight excess of KI, it is the protiodide.

The yellow iodide contains 3 atoms I, and 2 atoms Hg. It is stated in the chemical authorities which I have consulted, to be the sesqui-iodide of mercury. The readiness with which it is converted into HgI^2 and HgI, led to some further experiments with it.

When sublimed, I have found it to be invariably converted into HgI^2 and HgI.

Heated in a solution of chloride of sodium it is decomposed, the solution dissolving HgI^2, and leaving HgI.

When treated with repeated portions of strong boiling alco-

hol, it is also decomposed, HgI^2 is dissolved, and may be obtained by evaporating the alcohol, and HgI remains.

On referring to Boullay's paper on the double iodides, before mentioned I find that observations nearly similar have induced him to consider it a compound of the biniodide and iodide of mercury, and this appears its more probable composition, as it is scarcely to be supposed that the action of such feeble re-agents, would occasion its conversion into the biniodide and protiodide, if these did not previously exist in it. If this be the case it is a compound of 1 atom of biniodide and 1 atom of protiodide of mercury, united by the feeble affinity which would *a priori* be supposed to exist between substances approaching each other so nearly on the electro-chemical scale, and its formula is HgI^2+HgI.

A compound of biniodide of mercury and ammonia.—On adding ammonia in excess to a solution of the di-hydrargyro biniodide of potassium, I noticed a white precipitate to form. When the solution was concentrated the precipitate was dense, consisting of minute white acicular crystals; when a diluted solution was employed, no precipitate at first ensued, but upon standing, long snowy needles crystallized from it. These crystals were decomposed on drying, ammonia being evolved and biniodide of mercury remaining, which still retained the shape of the crystals, but had lost their consistence, falling to powder on the slightest friction. A similar change was rapidly produced by washing them with water, the white compound being first converted to an orange color, and, by further washing, to the brillant scarlet red of the biniodide of mercury.

The same compound is formed by digesting biniodide of mercury, with the aid of heat, in a large excess of strong aqua ammonia, or ammoniated alcohol, by which the biniodide is dissolved; upon cooling the liquor, the white double salt crystallizes from it.

The evanescent nature of this compound rendered it difficult to analyze, as it was found impossible to dry it without decomposition, even at a low temperature, under an air-pump.

It appears to require the presence of free ammonia for its preservation. In order to ascertain, approximately, its composition, a portion of it, as free from uncombined ammonia as possible, was put into water and shaken, by which it was decomposed, ammonia being dissolved, and biniodide of mercury subsiding. The latter was dried and weighed, and the ammonia contained in the water carefully neutralized with crystallized tartaric acid. The HgI^2 weighed 6.0 parts. The liquor required 2.0 parts ($\overline{T}+HO$) for saturation, which, by calculation, indicates .454 parts ammonia, that is

6.000 parts HgI^2	corresponding	1 atom HgI^2	454.6
.454 " NH^3	nearly with	2 " NH^3	34.30

After the above had been prepared, my attention was directed by one of the editors of this Journal, to Professor Kane's researches respecting the ammoniacal chloride of mercury; from the similarity of the mode of formation of this compound, it seemed probable that its composition might also be similar, and in order to ascertain whether this was the case, some further experiments were made.

When to a solution of 2 atoms of bichloride of mercury, 4 atoms of ammonia are added, the whole of the mercurial salt is precipitated, and 2 atoms of hydrochlorate of ammonia remain in solution. According to Professor Kane's views, the chlorine of the hydrochlorate of ammonia is furnished by the decomposition of 1 atom of the bichloride, the hydrogen by the decomposition of 2 atoms of ammonia, leaving amidogen, (a hypothetical compound of 1 atom of nitrogen and 2 atoms of hydrogen,) 2 atoms of which combine with 1 atom of mercury, forming the bi-amidet of mercury, which unites with the remaining atom of bichloride of mercury to form white precipitate, ($HgCl^2+Hg2NH^2$.) Accordingly, Professor Kane found when white precipitate was decomposed by heat, 2 atoms chloride of mercury remained, and the ammonia and nitrogen which were driven off, were in the proportion to form 2 atoms of amidogen.

With a view to ascertain whether similar phenomena were

exhibited by the ammoniacal biniodide of mercury, the following experiments were tried, the great difficulty of procuring it clear of water, and free ammonia rendering it impossible to arrive at an exact analysis.

1st. 10 parts HgI^2 were digested with heat in aqua ammonia until it was dissolved, the liquor cooled, and the double salt, which crystallized from it, separated. These crystals upon drying, (by which they were decomposed,) gave 8.40 parts, HgI^2. The liquor was then boiled until all the free ammonia was driven off, and fused nitrate of silver added until it ceased to produce a precipitate. This required 1.11 parts $\dot{A}g\ddot{\ddot{N}}$, which, by calculation, indicates (170.15 : 1.11 :: 126.3 : .824) .824 parts I, and as 1.60 parts HgI^2, which contain .90 parts I, remained in solution, we may conclude there was no hydriodate of ammonia formed.

2d. Into a tube, closed at one end and bent, was put a portion of the compound, still moist, and heat applied; the gases liberated were collected over mercury; these, on examination, appeared to consist wholly of ammonia and aqueous vapor. The scarlet powder remaining was soluble in alcohol, and solution of iodide of potassium, and sublimed by heat in yellow crystals, which became scarlet red on cooling—being evidently biniodide of mercury.

From this we may conclude that it is not an analogous compound to white precipitate. It appears to consist, as before stated, of 1 atom HgI^2, with 2 atoms NH^3, probably directly united; if this be the case, its formula will be HgI^2+2NH^3.

Not finding any notice respecting this compound in any of the chemical works to which I had access, I had at first supposed that it had not been hitherto observed, but have since seen, in the Annal. de Chimie et de Phys., a paper by Rose*—"on the combinations of ammonia with the anhydrous salts"—in the course of which, he states, that—"the red

* Annales de Chimie et de Ph., tome lxii. Des Combinaisons de l'Ammoniaque avec les sels anhydres. Par Henry Rose.

color of periodide of mercury is changed when in contact with gaseous ammonia to a dull white." He found .784 grammes of periodide of mercury in an atmosphere of gaseous ammonia, to absorb .055 grammes of the gas, from which he calculates the compound to contain 1 atom periodide of mercury, and 2 atoms ("*deux atomes simples ou un atome double*") of ammonia.

The description of this combination, as given by Rose, agrees very well with that above mentioned, and they are no doubt identical.

The orange coloured salt, formed by the action of a limited portion of water upon this compound, contains less ammonia, and is probably composed of 1 atom HgI^2 with 1 atom HN^3.

ART. LVII.—ON THE TARTRATE OF IRON AND AMMONIA.

By William Procter, Jr.

Several druggists of this city having been called upon for *tartrate of iron and ammonia*, which, from its novelty in a medical point of view, was not to be obtained, I have been induced to make some inquiry into the character of the salt, and ascertain an eligible process for its preparation, in case it should gain favor with the medical profession. The absence of all notice of it, in any of the chemical works usually to be obtained, is the motive for entering so much in detail.

The process for preparing the tartrate of iron and *potassa*, published in the last number of this journal, has been taken as a type in the formation of the succeeding formula, and the advantages of that process apply with equal force to the one under consideration.

The first step is to form the *bitartrate of ammonia*, as this salt is not, like the analogous one of potassa, ready at hand. It is readily made by dissolving four equivalents of tartaric acid in a suitable quantity of water, and adding gradually, one

equivalent of sesqui-carbonate of ammonia. The reaction is such, that the two equivalents of ammonia in the sesqui-carbonate, combine with the four equivalents of tartaric acid, forming two equivalents of bicarbonate of ammonia, while three equivalents of carbonic acid and a portion of the water of the tartaric acid is set at liberty. Like the bitartrates of the other alkalies, this salt is but slightly soluble in cold water; and it comports itself, when mixed with sesqui-oxide of iron, in a manner similar to cream of tartar.

Take of tartaric acid	100	drachms.
Sesqui-carbonate of ammonia (crystalline)	39⅓	"
Sesqui-oxide of iron	53⅓	"
Hydrochloric acid	180	"

Solution of ammonia and water, of each a sufficient quantity.

Dissolve the tartaric acid in a gallon of the water, and add the carbonate of ammonia gradually. A considerable quantity of a white crystalline powder subsides, which is bitartrate of ammonia, and with which the supernatant liquid is saturated.

Dissolve the sesqui-oxide (precipitated carbonate U. S. P.) of iron in the hydrochloric acid, by means of a gentle heat, dilute the solution with six pints of water, and add a sufficient quantity of solution of ammonia to precipitate the sesqui-oxide. Separate this on a flannel filter, wash it with water until the washings pass tasteless, and add it to the solution containing the bitartrate of ammonia; then apply a gentle heat, by means of a water bath, until the whole of the sesqui-oxide of iron is dissolved, and a deep reddish-brown solution results. The solution thus obtained should be evaporated, by means of a water bath, to dryness. It is of importance to the excellence of the product, that a moderate heat be employed, and that of a water bath is the best and most easily regulated.

It will be observed that the carbonate of ammonia is directed to be in a crystalline form, because, when it has fallen into powder, or lost its transparency, it has become more or

Fig. 1.

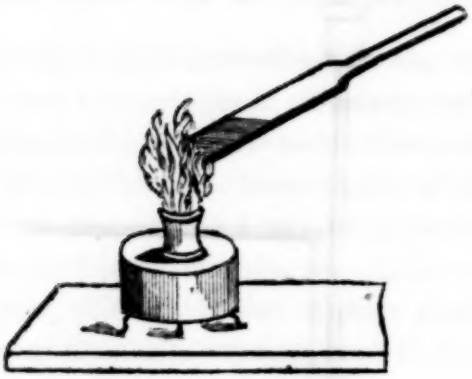


Fig. 2.

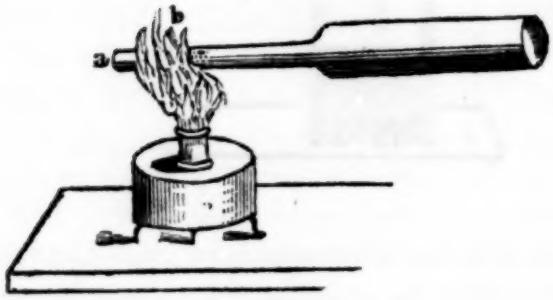


Fig. 3.

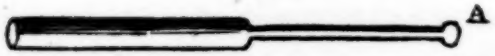


Fig. 4.

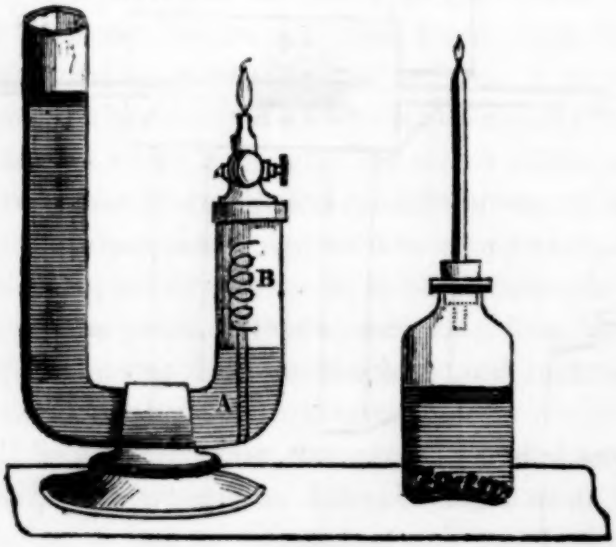


Fig. 5.

Fig. 6.

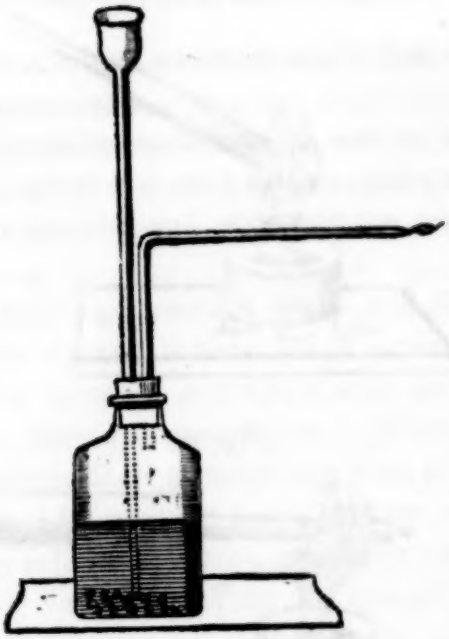
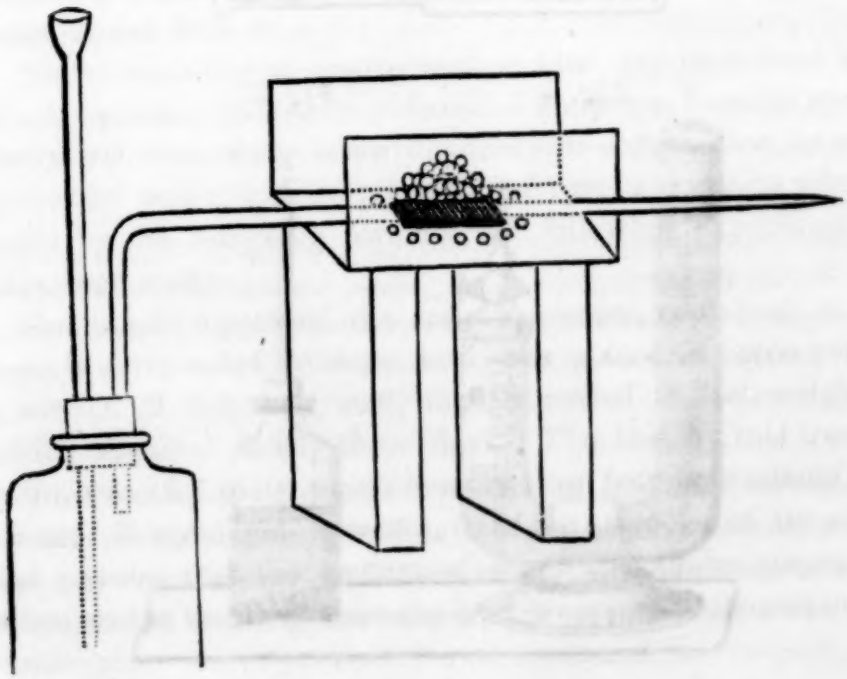


Fig. 7.



less a *bicarbonate*, which contains much less of the volatile alkali than the sesqui-salt.

In case the crystalline carbonate is not at hand, take half the tartaric acid, saturate it with the ammoniacal carbonate, in whatever state it may be, and then add the remainder of the acid.

When the quantity prepared is small, and the evaporating vessel is shallow, the salt is obtained in brilliant scales of a dark brown color in mass; but when held between the eye and the light, a beautiful garnet hue. When, however, the quantity is considerable, it presents the form of angular grains resembling kino. Its powder has a brown color, like iron rust. It is very soluble in water, requiring rather more than its weight of that fluid at 60° Fahr. for complete solution; but to effect this, it is necessary that they be in contact for many hours. When a solution of this tartrate is boiled, no change takes place, and it is consequently more stable than the tartrate of iron and potassa. Like that last named, this salt is insoluble in anhydrous alcohol, and is precipitated from its aqueous solution by it of a dull yellow color. It is totally insoluble in ether, the grains not even agglutinating together when mixed with it.

Notwithstanding an approximative idea may be formed of the composition of tartrate of iron and ammonia, from its synthesis, yet to ascertain more definitely its composition, as regards the water and sesqui-oxide of iron it contains when made by the foregoing formula, the following experiments have been made.

One hundred parts of the salt, in powder, contained in a capsule surrounded by warm sand, was placed in vacuo over a surface of sulphuric acid, until it ceased to lose weight, which required nearly three days. The loss, by this treatment, was 15.7 parts, which is more than four equivalents of water. It is evident, however, from the character of the salt and process, that the amount of water it contains, depends much on the length of time the heat is applied in its evaporation.

When 30 grains of the hydrous salt was carefully incinerated, a residue of 8.70 grains of sesqui-oxide of iron was obtained; 30 grains of the hydrous tartrate is composed of 25.29 grains of dry salt, and 4.71 of water; then, theoretically, the quantity of sesqui-oxide in 25.29 grains of the anhydrous salt is 8.83 grains, nearly that obtained by experiment.

An aqueous solution, containing a known weight of the double tartrate, was precipitated by alcohol 40° Baumé. The precipitate, when collected and dried, was found to have lost weight nearly in proportion to that dried in vacuo. A portion of this was incinerated, and the quantity of sesqui-oxide obtained was found to be in the proportion of that yielded by the salt when dried in vacuo.

The fact that one of the bases, as well as the acid in this salt is volatile, presents a difficulty in its analysis which is not found in that of tartrate of iron and potassa. While the estimation of the iron is comparatively easy, that of the acid is proportionably difficult. Attempts were made to estimate the quantity of tartaric acid, with the chlorides of calcium and barium, and the bisulphate of potassa, but in each instance, the precipitate obtained did not contain half the acid that theory required; the object was attained, however, by the employment of nitrate of lead.

To 30 grains of tartrate of iron and ammonia in solution, an excess of nitrate of lead was added, the mixture heated, and when cold, the precipitate, washed, dried, and weighed, amounted to 44 grains, and had a yellowish color.

When 30 grains of this precipitate was carefully incinerated, 20 grains of residue was obtained, and the loss (tartaric acid) 10 grains. Consequently, if 30 : 10 :: 44 : 14.66 grains, or the amount of acid in 30 grains of the hydrous salt, by the result ot this experiment. Theoretically, as 273 (the equivalent of the hydrous salt) is to 133, (the quantity of acid it contains) as 30 (hydrous salt) is to 14.61, (the quantity of acid it should contain.) Thus it is evident, that the theoretical and practical results are sufficiently near to infer the presence of two atoms

of tartaric acid in one of the salt. It follows, as a consequence, that the remainder unaccounted for, after estimating the water, oxide of iron, and tartaric acid, is ammonia; so that the following statement of the whole result will give the relation between theory and experiment, in 30 grains of the salt.

	Experiment.	Theory.		
Sesqui-oxide of iron	8.70	8.82 = 80.	1	equiv.
Ammonia	1.93	1.86 = 17.	1	"
Tartaric acid	14.66	14.61 = 133.	2	"
Water	4.71	4.71 = 43.	4	"+
	30.00	30.00		

Formula $(Fe^2O^3+\overline{T})+(H^3N+\overline{T})+4HO+$

ART. LVIII.—MEMOIR UPON THE DETECTION OF ARSENIC FORMING A TOXICOLOGICAL COMPENDIUM, AS FAR AS REGARDS THIS SUBSTANCE. By Augustine Duhamel.

Chapter of Contents.

Preliminary observations—Arsenical preparations employed as poisons—Character of arsenious acid—Distinctive characters presenting means of its recognition—Reduction—Manner of proceeding when this substance is made the subject of medico-legal inquiry—Marsh's apparatus, with the modifications and improvements upon it—Figuier's process for separating the organic matters, and isolating the arsenic by an improved and infallible method—Absorption of arsenic by the animal tissues, and its detection after long inhumation—Symptoms which betray the poisonous action of arsenic upon the living economy—Antidote.

The lamentably frequent instances of human destruction by this energetic poison, both in this and other countries, render it obvious to every reflecting mind, that any means which may be used to bring the subject fully under the notice of apothecaries and physicians, should command the deepest at-

tention. The recent case of Madame Laffarge, in Paris, charged with the crime of poisoning her husband, which enlisted in the cause some of the ablest chemists of Europe, and her subsequent conviction, mainly owing to evidence adduced through chemical investigation, serves to illustrate the importance of a familiar acquaintance with this branch of analytic chemistry, and likewise the skill requisite in the management of such nice operations, in order to arrive at unerring conclusions. Though viewed but as an accessory branch of chemistry, it behooves every apothecary to perfect himself in the knowledge of toxicology. Incompetency, in this respect, might lead to the escape of a hardened criminal from merited punishment; or, what is worse, consign an innocent fellow being to an untimely end.

From a general belief that physicians and druggists, by virtue of their vocation are thoroughly versed in all its kindred branches, (as they should be,) they are often required to pronounce upon the exact nature of a substance, used either in medicine or the arts. Among these may be found a few whose scientific attainments, united to practical experience, would justify their being intrusted by a court of justice with any object of chemical investigation, but by far the greatest portion are deficient in the requisite skill, as well as theoretical knowledge. These observations apply with peculiar force in this country, where the whole range of poisons, is accessible to the applicant, and where the want of legislative protection engenders so many self constituted apothecaries and physicians.

To be acquainted with the theory of chemistry only, is not enough. The mere experimenter will be embarrassed in the application of its principles, and in very simple operations connected with the use of re-actives, will fail to establish his convictions as to the nature of the substance under examination.

A great bar to an acquisition of the proper knowledge, is that most, if not all of the treatises, upon toxicological chemistry, are by foreign writers, and some in a foreign language,

and consequently within the reach of very few apothecaries in this country.

Sensible of these deficiencies, and as an apothecary, feeling how likely some of us may, one day or other, be placed in a situation requiring an application of our chemical knowledge in presence of judicial authorities, it occurred to me that a *manual* or *code*, based upon established processes taken from the most authentic sources, would be of immense utility in guiding an operator in his researches. For this purpose I have collected the choicest matter in reference to this subject, contained in the works of Berzelius, Leibig, and Orfila, chemists, whom the scientific world, look up to, as the highest authorities. I have also derived valuable assistance from the use of selections made by M. Lassaigne, and embodied in his very useful work entitled, "Dictionnaire des Reactives," illustrated by diagrams some of which I have transferred to this paper.

Having concluded these incidental remarks I shall now proceed with my labors in the order prescribed.

The form in which arsenic is commonly adminstered as a poison is that of arsenious acid, or *white arsenic*, commonly called *ratsbane*. The sulphurets are sometimes used, being kept in the shops under their common names of Realgar and Orpiment; their employment, however, is rare, on account of the difficulty of disguising their color, and their being poisonous in a far less degree than white arsenic. Of this last it is our main object to speak.

White arsenic, ranked at the present day among the acids, is met with in commerce, in white pieces, opaque at their surfaces, commonly presenting, in their interior, a semi-transparent and vitreous layer. Its specific gravity is 3.7. Exposed to the air it soon loses its primitive transparency and becomes of a milk white color, more friable and according to Guibourt, a little more soluble in water. Its taste is harsh, and slightly acrid, with a sweetish after taste. Heated in open vessels it wholly sublimes in small transparent tetrahedral crystals. Thrown upon burning coals, it volatilizes in white

smoke, with a characteristic alliaceous order. This odor, due to a portion of arsenic reduced by the contact of charcoal, is not manifested when the arsenious acid is placed upon a red hot brick, it then volatilizes without sensible odor. This acid is sparingly soluble in water; hot water dissolves more than cold water; at $+15°$ it dissolves $\frac{96}{10000}$ and at $+100°$ $\frac{968}{10000}$, so that a part of the acid separates in a crystalline form by the cooling of the solution.

Composition.

Arsenic	75.82 or 2 atoms	}	Its formulæ
Oxygen	24.18 or 3 "	}	is $\ddot{A}s$
	100.00		

Distinctive Characters.

1st. Reduced to fine powder, and thrown upon glowing charcoal, the arsenious acid is at once disengaged in the form of white vapors of an alliaceous odor, leaving no residue upon the charcoal. If during its volatilization you place within two inches of it a bright plate of copper, the vapors condense upon it, giving a white coating to the metal, but if the plate is held too near the fire, say within a line or two, you obtain a black or grayish coat.

The blackish color developed in the latter case, depends (according to Orfila) upon a portion of metallic arsenic deposited upon it, and which being reduced by contact with the charcoal, condenses upon the plate previous to being burnt by the oxygen of the air. (Jour. de Chimie Med. et de Tox. vol. 5th.)

2d. Dissolved in boiling water, its solution feebly reddens tincture of litmus. Lime water added in excess occasions a white precipitate of *arsenite of lime*, soluble in an excess of acid; hydosulphuric acid communicates to it a golden yellow color, which a small quantity of ammonia causes to disappear, and which the acids re-establish, forming a flocculent yellow precipitate of sulphuret of arsenic.

If you abandon to itself the solution mixed with hydrosulphuric acid it becomes after sometime turbid, and deposits yel-

low flocks; the addition of a few drops of hydrochloric acid produces this effect instantly and the precipitate formed enjoys the property of re-dissolving in liquid ammonia, and again to be separated by the acids.

3d. Saturated by several drops of alcoholic potash, this solution produces with nitrate of silver a flocculent canary-yellow precipitate, which becomes brown by the action of light, and a fine herb green precipitate (deuto-arsenite of copper) with the deuto-sulphate of copper. With the ammoniacal sulphate of copper, this last effect is produced in a solution of arsenious acid unsaturated by the potash.

4th. By evaporating to dryness, the solution of arsenious acid, saturated by the potash, mixing the residue with a little charcoal, and calcining it by the flame of a spirit lamp, in a small tube drawn out slender at one end as represented in the plate fig. 1, you obtain at a small distance from the heated point a brilliant encrustation of metallic arsenic, which adheres to the sides of the tube, and gives to it the appearance of mirrored glass.

5th. A small quantity of powdered arsenious acid, intimately mixed with a little black flux (a mixture of carbonate of potash and finely divided charcoal, obtained by deflagrating in a crucible heated to redness, 2 parts of cream of tartar and 1 of nitre,) also furnishes a like result upon calcining this mixture in a glass tube drawn out to a point.

6th. Again, the reduction of arsenious acid may be effected upon minimum quantities, according to Berzelius, by the following process: Draw out by means of a spirit lamp, a common tube so as to taper it down to the diameter of a strong knitting needle; then close the narrow extremity several inches distant from the point whence drawn. Introduce a small grain of arsenious acid in the closed end, a, (see fig. 2,) and place over it as far as b, small particles of very dry charcoal; hold the tube horizontally in the flame of a spirit lamp, so as at first to heat only the charcoal, and when this is heated to redness, carry the flame to the extremity of the tube a, where the arsenious acid is contained. This, in volatilizing, is reduced by the contact of the heated charcoal, and condenses at a

little distance front of it in the form of a brilliant metallic ring, and which may be driven further along the tube by the approach of the flame. Cut the tube at the place where the metal is found, then heat, it keeping the nose at some distance above it, and the arsenical odor will be perceived in the most sensible manner. This experiment may be made upon a piece of arsenious acid so small that a piece sufficiently large to be taken from its place and introduced in the tube, will give a decided result. (Berzelius.)

The following table from Lassaigne, displays the sensibility of the reactives employed in these experiments.

Quantity of arsenious acid dissolved in water.	*Hydro-sulphuric acid.*	*Hydro-sulphate, and acid.*	*Ammoniacal sulphate of copper.*	*Lime water.*	*Barytes water.*
$\frac{1}{15000}$	Yellow.	Pale yellow precipitate.	Herb green precipitate.	Flocculent white precipitate.	None.
$\frac{1}{30000}$	Yellow.	Idem.	Idem.	First nothing, then becomes turbid and precipitates.	None.
$\frac{1}{60000}$	Yellow.	Idem.	Idem but less intense.	None.	None.
$\frac{1}{80000}$	None.	Whitish yellow precipitate.	Pale green precipitate.	None.	None.
$\frac{1}{120000}$	None.	Idem.	Idem.	None.	None.
$\frac{1}{150000}$	None.	None.	Clear green precipitate.	None.	None.
$\frac{1}{160000}$	None.	None.	Very pale green precipitate.	None.	None.

Having concluded with the exposition of the distinctive characters of arsenious acid, we now come to the consideration of this substance under a *medico-legal* head, which embraces the application of the above cited experiments to cases of poisoning by it.

In order to know whether a suspected substance, which has occasioned death, contains any arsenic—

1st. Ascertain if there be any of it left remaining; upon finding which, you submit it first to the action of fire, to destroy organic matters, then dissolve it in boiling water, and test it with chemical reagents, to see if it comports with the character of arsenic.

2d. If what remains should be a liquid, then evaporate a portion of it in a porcelain capsule, and examine the residue, by employing the means for reducing arsenic to the metallic state, which only can be regarded as certain proof.

3d. In case all the poison has been swallowed, you must act upon the matter ejected by vomiting, separating first the fluid parts, by means of a filter, which liquid you test with the reagents. Search among the solid parts for solid, granular particles, which, thrown upon burning charcoal, give out a white smoke with an alliaceous odor. If these experiments furnish no result, it will be necessary to boil a portion of the solid parts with about twelve times its weight of distilled water for fifteen minutes, then filter, and submit the liquid to the tests above indicated.

4th. The matters collected after death, in the stomach and intestines, should be submitted to the same investigations: these may be summed up under these three principal heads: (1.) Search with the naked eye, and afterwards with a lens, to ascertain if there be not some solid particles of arsenious acid in these matters, and, if it be possible, extract them mechanically for particular examination. (2.) If these matters contain no visible particles of arsenic, strain them forcibly through a piece of white linen to separate the liquid portion, which should be filtered and examined with care. (3.) If these trials have not led to the discovery of arsenious acid, treat the ex-

pressed solid matters with about ten times their weight of boiling water, in a porcelain capsule or glass matrass, and after filtering the decoction, you acidulate it with a few drops of hydrochloric acid and bring it in contact with hydrosulphuric acid gas. If the solution contains arsenious acid it becomes colored yellow, and a precipitate of sulphuret of arsenic is formed. In this case it will be useful to prove that this precipitate is occasioned by arsenious acid existing in the solution, as the yellow color of the sulphurets of *selenium*, *cadmium*, *tin* and *antimony*, might be mistaken for it. For this purpose, gather the precipitate, dissolve it in water of ammonia, afterwards evaporate the ammoniacal solution, and calcine the residue in a slender tube with a little black flux or potash; the arsenic, separated from its combinations with the sulphur, volatilizes, and will be easily distinguished by its brilliant metallic aspect, and the alliaceous odor which it gives out by contact with incandescent charcoal.

Berzelius has pointed out another process, different from this, and which he considers an excellent method for proving the existence of arsenic in *medico-legal* cases. It is a modification of one proposed by Valentine Rose. It is as follows:

Boil the contents of the stomach, and its membranes cut into pieces, with several drachms of caustic potash, to dissolve all the arsenic: supersaturate the liquid with hydrochloric acid, filter, and pass through it a current of hydrosulphuric acid gas. If it contains any arsenic, it becomes, after a short time, yellow, and then a precipitate of sulphuret of arsenic takes place in the form of a yellow powder. If the quantity of arsenic is very feeble, the liquid becomes yellow without the formation of a precipitate, but by evaporation the sulphuret of arsenic is deposited in proportion as the acid is concentrated by the evaporation. (The mere yellow color of the liquid should not be considered as a proof of the existence of arsenic, as this tint is likewise produced by the nitric acid, which, being reduced to nitrous acid, colors yellow the dissolved animal matters.) Pass the solution through a small filter, and wash the sulphuret of arsenic. If it is in so small a

quantity as not to be separated from the filter, then take it up by means of caustic ammonia, which you afterwards evaporate in a watch glass; the sulphuret which remains may be detached from the glass and collected. You then transform it to arsenic acid; for this purpose, throw it by little at a time upon nitre in a state of fusion, and contained in a glass tube closed at one end. The sulphuret of arsenic oxydizes with a slight effervescence and without deflagaration; then dissolve the salt which remains in a few drops or least possible quantity of water, add to the liquid an excess of lime water, and boil it, to collect together the arseniate of lime. Expose this salt to a moderate red heat, mix it with recently burned charcoal, and introduce the mixture into a glass tube, narrowed towards one extremity and terminated by a hollow ball, (see fig. 3,) into which the mixture is received.

Commence by heating the tube to drive out any moisture. Then expose the part A to the flame of a blowpipe, until the glass begins to melt. The arsenic is then reduced and collects in the narrow part of the tube, where it spreads over a surface so small that the minutest quantities may be recognised. One-tenth of a grain of sulphuret of arsenic is sufficient to give a decided reaction.

In such delicate experiments as are required in the detection of arsenic, where even traces should not escape observation, you must be certain that the reactives employed are in no wise contaminated with arsenic. For instance, it might happen that the hydrochloric acid contains some, for the reason that sulphuric acid is often made from pyrites or arseniuretted sulphur, and in this case the arsénic passes along with the hydrochloric acid during its preparation. For this reason, you must first convince yourself that your sulphuric acid, for disengaging the sulphuretted hydrogen, and the hydrochloric acid, are free from arsenic, which may be done by passing over them a current of sulphuretted hydrogen.

Where the poison has been produced by arsenic acid, sulphuretted hydrogen reacts with difficulty, and in a less decided manner. In this case you must supersaturate your acid

liquid with hydrosulphate of ammonia, then heat it gently for an hour, and precipitate with hydrochloric acid. The precipitate, which in all likelihood may be nothing more than sulphur, is treated as has just been directed. If it contains no arsenic, lime water will produce no precipitate. (Berzelius.)

While one or two of these experiments, by their results, may tend to confirm suspicion as to the presence of arsenic—the concurrent testimony of the whole is necessary to form a proper conviction in the mind of the operator.

The ordinary tests of ammoniacal nitrate of silver, and ammoniacal sulphate of copper, give uncertain results. Phosphoric acid, for instance, precipitates nitrate of silver yellow, like arsenious acid, and decoctions of onion, and unburnt coffee, when mixed with potash, form with salts of copper green precipitates, which resemble Scheele's green.

The reduction alone may be regarded as positive proof, and renders the others superfluous; when this does not succeed, the result is always doubtful. An operator, not much accustomed to these operations, may often imagine he perceives the smell of arsenic in the odor of animal matters and yet be mistaken. Upon this subject it is well to repeat, that no physician or chemist should give testimony in court regarding the detection of arsenic, unless he has himself assisted in the investigation, or been a witness to the examination conducted under skilful hands, and who have affixed their signatures and seals to the vessels containing the mixture.

The processes thus far detailed for testing arsenic, though good in themselves, have in a great measure given way to a more recent one, for which we are indebted to the ingenuity of Mr. James Marsh. It consists in the application of hydrogen gas, and possesses the advantage of simplicity, in separating minute portions of arsenic from organic substances, by a prompt and convenient method.

It is founded upon the property which hydrogen, in a nascent state, possesses, of reducing arsenious and arsenic acids, and forming, with their metallic radical, arseniuretted hydrogen gas, which separates spontaneously, by reason of its elas-

ticity, from the liquid in which it is produced, and may be collected in an ordinary gas recipient for future examination. It presents the means of obtaining in a direct manner, small quantities of arsenic from viscous alimentary liquids, such as gruel, soup, porter, coffee, wine, &c.

This apparatus, as represented in fig. 4, consists of a glass tube open at both ends, and about ⅜ths of an inch in its internal diameter. It is bent in the form of a syphon, the shorter leg being about five, and the longer eight inches in length. A stopcock, ending in a jet of fine bore, passes tightly through a hole made in a sound cork, which fits air tight in the opening of the shorter branch. Lastly, the apparatus is placed in an upright position, and braced to a wooden support.

A bit of glass rod, A, about an inch long, is dropped into the shorter leg, followed by a piece of pure sheet zinc, B, bent double, or coiled so that it runs down the tube till it is stopped by the piece of glass rod first put in.

When you wish to experiment upon a suspected liquid, mix it with a certain quantity of distilled sulphuric acid, (one part acid to seven of liquid,) and pour it into the long branch of the apparatus, until it stands in the short one about ¼th of an inch below the cock kept open. Bubbles of gas will be seen to rise from the zinc, which are pure hydrogen if no arsenic be present, but if the liquid holds arsenic in any form in solution, the gas will be arseniuretted hydrogen. Allow the first portions to escape, in order to drive out the atmospheric air, then close the cock, and the gas will collect in the shorter leg and drive the fluid up the longer one till the liquid has descended in the short leg below the piece of zinc, when no more gas is produced, as in the case of the hydrogen gas lamps.

Upon quickly igniting the gas as it issues from the jet, and then holding horizontally in contact with the flame a plate of glass or porcelain saucer, the arsenic will be found deposited upon these cold bodies in the form of round spots of a grayish black color and metallic lustre. If no arsenic be present, then

the flame as it burns has a different appearance; the flame is yellowish, transparent and deposits only water.

Should you wish to obtain the arsenic in the form of arsenious acid, then take a glass tube from ¼ to ½ an inch in diameter, or according to the size of the jet of flame, and eight or ten inches in length, and hold it vertically over the burning jet of gas in such a manner that the gas may undergo perfect combustion, and the arsenic combined with it becomes sufficiently oxidized; the tube will thus, with proper care, become lined with arsenious acid, in proportion to the quantity originally contained in the mixture.

When the glass tube is held at an angle of about 45 degrees over the jet of flame, *three very good indications of the presence of arsenic may be obtained at one operation*, viz.: metallic arsenic will be found deposited in the tube at the part nearest where the flame impinges, arsenious acid or white arsenic at a short distance from it, and the garlic smell can be readily detected at either end of the tube. (Marsh.)

These indications of arsenic are manifested as long as the process is continued, or the supply of gas kept up.

It is asserted that $\frac{1}{7000}$ of arsenious acid in solution is manifested in a short time by this process.

Marsh says, that with his apparatus he has obtained distinct metallic crusts when operating on as small a quantity as one drop of Fowler's solution, which contains only $\frac{1}{120}$th, of a grain. The presence of arsenic in artificial orpiment and realgar, in Scheele's green, and in the sulphuret of antimony, may be readily shown by this process when not more than ½ grain of these compounds is employed.

In cases where the above described apparatus cannot be easily procured, its place may be supplied by simpler means. Take a wide mouth vial, fitted with a perforated cork, through which a tube drawn at one end to a fine point passes. (See fig. 5th.)

By putting the liquid you wish to examine, into this vial together with zinc and sulphuric acid, and covering the whole with a layer of sweet oil, about two lines in thickness, to

prevent the frothy effervescence choking the tube, the same results may be obtained as with the other apparatus.

Marsh directs that the matter to be submitted to examination, if not in the fluid state, such as pastry, pudding, or bread, be boiled with two or three ounces of pure water for a sufficient length of time, and then thrown upon a filter to separate the more solid parts. Thick soup and the contents of the stomach to be also diluted with water and filtered, but tea, coffee, cocoa, &c., water, gruel, wine, spirits or malt liquors, can be operated upon without any previous process.

A modification of Marsh's apparatus has been proposed by Orfila, consisting of an ordinary vial, closed by a cork pierced with two holes, which give passage, the one to a straight tube of a foot long which plunges into the liquid, the other to a tube bent at right angles, with one extremity a short distance below the cork, while the other is drawn out to a fine point whence the gas issues. (See fig. 6th.)

To avoid the frothy effervescence which pushes a portion of the liquid out of the apparatus, and prevents the hydrogen gas from burning, and to dispense with the use of oil, which has been indicated in this circumstance Mr. Orfila, has entertained the happy idea of destroying the organic matter by burning it with nitrate of potash, and thus rendering the extraction of the arsenic more easy.

His new disposition of the apparatus permits the introduction of the suspected liquid into the vial without uncorking it.

The test with hydrogen is, however, not infallible. More recent experiments made by Thompson with Marsh's apparatus, prove that antimony treated under the same circumstances, produce black metallic crusts upon porcelain. These stains, which at first sight might be confounded with those caused by arsenical preparations, are thus distinguished.

1st. They only volatilize in part when exposed to a flame of pure hydrogen gas.

2d. Heated with nitric acid they are transformed into antimonious acid which undergoes no change by nitrate of silver in solution, whilst the spots of arsenious acid produce arsenic acid by this re-active, giving a precipitate of a brick red color.

In the October number of the "Journal de Pharmacie," for the year 1840, is a paper by M. L. Figuier, upon the detection of arsenic, in which the inconveniences of the Marsh apparatus are pointed out, and an important improvement recommended which removes all doubt as to the result.

These inconveniences (alluding to the modified apparatus of Marsh, and more commonly employed—a simple bottle—mounted with a tube,) are summed up under the following heads.

1st. The mixture of hydrogen and atmospheric air in the vessel forms detonating gas. In executing a toxicological experiment you incur the danger of an explosion if you light the gas too quick, with consequent breakage of the vessel and a loss of liquid probably irreparable; or to obviate this, you allow the gas as it disengages to escape for some time in order that the common air may be driven out, by which means you lose a certain quantity of arsenic, which, however small it may be, should not be viewed with indifference, when we consider the very small quantity generally contained in these experimental liquids.

2d. A more serious inconvenience, not easily overcome, consists in the frothy development which, when it occurs, renders further operation very difficult.

3d. The manner of inflaming the arseniuretted hydrogen as it escapes from the tube, and receiving the reduced metal upon a cold body, is liable to this disavantage. The flame of hydrogen gas applied to spots of metallic arsenic already formed, volatilizes the metal, when the volume of flame is large and the orifice of the tube irregular. On the other hand it has been observed by experiment that a solution containing but a minute portion of arsenious acid does not show any stains upon porcelain, if the flame has but a very feeble intensity.

For the above given reasons, Mr. Figuier considers Marsh's apparatus susceptible of improvement.

Messrs. Liebig and Berzelius, acting under this belief, proposed to reduce the arsenic by applying heat to a part of the tube. Mr. Chevallier, adopting this modification, recommend-

ed a further improvement by the introduction into the tube of disengagement, of fragments of porcelain, with the double object of multiplying the heated surfaces offered to the passage of the gas, and to effect the separation of antimony from the arsenic, sometimes accidentally mixed with it. By decomposing a mixture of arseniuretted hydrogen and antimony, the arsenic condenses in the cool part of the tube, and the antimony deposits upon the heated pieces of porcelain. This mixture, however, rarely occurs.

Mr. Figuier not being able to find in any of the methods yet proposed one which he could adopt with perfect confidence, for the detection of arsenic in organic matter, ventures to supply the deficiency by giving a process which, he says, *reunites all the conditions necessary to complete success.* He, however, enjoins upon the experimenter the precaution to have perfectly pure re-actives, (free from arsenic.)

Description of Figuier's process.

The suspected matters, as usual, are cut up in pieces.

Introduce them into a glass matrass and cover them over with a convenient quantity of water. The matrass is placed upon a sand bath, the water carried to ebullition and sustained for four or five hours, keeping up a very feeble alkaline reaction. When the decoction is cold, the fat swims, congeals and separates: then filter: a reddish viscous liquid is collected, which passes slowly through paper.

Evaporate the filtered liquid to dryness, first acidulating it slightly with hydrochloric acid, and let the residue be dried without carbonizing the substance. Then redissolve the animal extract in hot water and filter it. The brown liquid which passes is then submitted to a current of washed chlorine, until it ceases to be turbid under the influence of the current of gas, an operation which requires some time. The pale yellow precipitate which is abundantly produced, being separated by filtration, a tolerably fluid yellow liquor is obtained, which contains but a very small quantity of organic matter, rendering further operation easy from the absence of the frothy development. As the liquid contains some chlo-

rine which would decompose the nascent arseniuretted hydrogen, it must be placed in a porcelain capsule and heated to ebullition to drive off the chlorine. The liquid is now fit to be introduced into the apparatus.

The apparatus, which is a modification of that of Marsh, is similar to that represented in fig. 6th, and very much the same as is used in the laboratory of the School of Pharmacy of Montpellier, by Messrs. Balard and others engaged in toxicological analyses.

It consists of as traight necked bottle, holding about ¾ths of a quart, and fitted with a cork traversed by two tubes. The one surmounted by a funnel reaches to the bottom of the liquid contained in the bottle, the other is a bent tube of about 7 or 8 millimetres (3 lines) in diameter, and finely drawn out at its extremity. A convenient way of forming this tube is to make it of two others. One of common diameter connected with the cork and bent, the other of the diameter indicated, to contain the chloride of calcium and porcelain. They may be connected by sheet caoutchouc.

Place in the horizontal tube, first, some pieces of fused chloride of calcium, and afterwards some fragments of porcelain, and afterwards apply heat to this part of the tube.

For this purpose, arrange a small grate, about four inches lengthwise and two in breadth, formed of three rectangular plates of sheet iron, of which the inferior one should be pierced with holes to give passage to the air, and should also support the tube to be heated. Two bricks placed under this will give it the proper elevation. (See fig. 7.)

As the tubes are unable to support a red heat without melting, choose for the tube, glass as little fusible as possible, wrap around the part exposed to the fire a sheet of scraped copper, and fasten this with copper wire.

The tube, thus protected, can neither be deformed or obstructed by fusion.

Commence now, by pouring through the straight tube into the bottle, containing about twelve drachms of zinc, some sulphuric acid, diluted with seven times its weight of water. The

hydrogen forms, and as it disengages, soon drives out all the atmospheric air. Allow the gas to escape for some time, to remove all chance of an explosion, then heat the tube to redness, by placing burning charcoal in the grate. You now introduce the decoction, previously treated as above directed. The froth that may arise, in the course of the operation, can never become troublesome. Should this, however, occur, you can make it descend by pouring a small quantity of alcohol into the straight tube.

However little the liquid under examination may contain arsenic, it soon manifests itself at a short distance from the heated portion of the tube, in the slender part, where a small shining circle of metallic arsenic goes on increasing during the operation. When you perceive that the metallic zone does not grow any bigger, then arrest the operation, which may be maintained one or two hours, taking care that all the zinc employed should be as much as possible dissolved. When the tube is cold, you may separate it from the rest of the apparatus, and assure yourself of the volatibility of the metal obtained, and test some of its properties without altering its metallic aspect. Lastly, close the two extremities of the tube by means of a lamp, and preserve it for the purpose of conviction in a court of justice.

In a new memoir read before the Royal Academy of Medicine, January, 1839, Mr. Orfila has shown, by a series of experiments repeated in cases of poisoning by arsenic, that this acid, introduced into the stomach or applied upon the cellular tissue of living dogs, is absorbed, and mixes with the blood, and is carried into all the organs of the economy.

That it is to this absorption of the poison, that death, which follows, must be attributed.

And that it is possible, with the aid of certain chemical processes, to separate metallic arsenic from the portion of arsenious acid absorbed, even when no traces of this acid have been discovered in the matters proceeding from the stomach and intestines of the person poisoned.

Mr. Orfila establishes, that arsenic may be detected *in ex-*

treme cases in poisoned animals, by acting upon a certain number of muscles, or one of the viscera of the animal economy, previously dried, especially when these viscera are very vascular: but it is preferable to act upon the entire corpse, or half of it at least, as the proportion of acid absorbed is very small. He says it may likewise be detected in the blood extracted by bleeding, when it amounts to several ounces in quantity.

In reference to the detection of arsenic in bodies, exhumed a long time after death by this poison, M. Orfila says:

That it is possible to prove the presence of arsenious acid, mixed with animal matters, even after the lapse of several years.

That if the arsenious acid has been employed in a solid state, it is possible to perceive, after long inhumation, here and there particles, which, being detached with the point of a penknife, presents all the characters of this poison.*

He says that there is no doubt but that arsenious acid, after some length of time, is transformed into arsenite of ammonia, more soluble in proportion as the animal substances produce the ammonia; so that after the lapse of several years it might be difficult to detect the presence of arsenic, from its forming a soluble compound with the ammonia, and filtering into the earth, during an advanced state of putrefaction of the body.

M. Orfila has himself proved, by experiment, that it is possible to find again this acid in the remains of a corpse, after seven years inhumation. (Jour. de Chimie Med. vol. vi.)

It is of the highest importance for every one to know what are the phenomena which give rise to the suspicion of poisoning by arsenic, and the proper means to employ as an antidote. The symptoms, occasioned by a large dose of arsenic, commence about a quarter of an hour after the poison has been taken. The patient at first experiences pains of the stomach, accompanied with anxiety, then a burning heat of the stomach

* And to be convinced that these grains are really arsenious acid, no means offer of conducing to more certain results, or of easier execution, than their reduction to the metallic state.

and intestines, with inextinguishable thirst: after this comes, alternately, vomitings, frightful colics, and sometimes a violent diarrhœa, in which the rectum loses its internal coat and becomes ulcerated: cold sweats, syncope, severe spasm of the arms and legs, loss of the senses, convulsions, and finally death. This horrible condition may be prolonged from five to ten hours, and often beyond that. After this the body becomes much swollen, and in the case of a plethoric person in the hot season, it promptly enters into putrefaction, in which, however, the arsenic has no direct agency. Upon the opening of the body, the internal membrane of the stomach is found marked with ecchymosis, and here and there corroded, and destroyed. Still, it is not without example, that poisoning by arsenic has taken place without any apparent inflammatory symptoms. The vessels of the brain are gorged with blood, and frequently ruptured, exhibiting the same phenomena as in the case of apoplexy, except in a higher degree.—(Berzelius.)

The most effectual antidote to the poisonous effects of arsenic is the *hydrated peroxide of iron*, for which we are indebted to the recent discovery of a German physician. (For a description of its method of preparation see American Journal of Pharmacy, vol. vi.—new series.)

This antidote must be administered as soon as possible, after the discovery that arsenic has been taken, and as it produces no bad effects itself, should be given every five or ten minutes, until entire relief is obtained.

It is given in a semi-liquid state, in the dose of a table-spoonful to grown persons, and less to children.

ART. LIX.—INTRODUCTORY LECTURE TO THE COURSE OF MATERIA MEDICA IN THE UNIVERSITY OF PENNSYLVANIA. By Geo. B. Wood, M. D.

Delivered November 3, 1840.

Allow me, gentlemen, before proceeding to the peculiar duties of the occasion, to greet heartily my old friends among you, and to those who are here for the first time to proffer my kindest regards, while I ask for theirs in return. It is always my anxious desire, when entering with the class upon our mutual labors for the winter, that we should go hand in hand together. Not only is the way thus rendered more agreeable both to teacher and pupil; but they are also enabled to advance more rapidly; as the intellect always operates with greater efficiency when aided by the affections. That head must be empty indeed which the heart cannot stimulate into action. The consciousness that he possesses the good will of his class is to the lecturer one of the most powerful incentives to exertion; and instruction seldom fails to sink deeply into the learner, when he feels that it proceeds as much from interest in his welfare as from a sense of duty. Let us, therefore, gentlemen, set out as friends upon our contemplated journey. You will find me disposed to do everything, during its course, which will contribute to leave us friends at the end of it.

I have selected, as the subject of this Introductory Discourse, the History of the Materia Medica in the United States. In this choice, I do not wish to be considered as actuated by any narrow preference of the discoveries or improvements made in our own country over those of foreign origin. Our patriotic partialities have been appealed to in favor of American medicine in contradistinction to that of the old continent. But this is folly, or something worse. Medicine is a science, and science is truth brought to light. Now truth is one everywhere. She is of no place or country.

Wherever she may be brought forth, from the moment of her birth she belongs equally to the whole world. She brooks no individual nor national fetters; but is the common friend and servant of mankind. To speak of an American truth would be absurd. Would it be less so to speak of American medicine as something distinct from the general science? But, though it becomes us to throw aside that impolitic self-conceit of patriotism which undervalues whatever comes from abroad, and stigmatizes with the ancient Greeks and modern Chinese everything foreign as barbarous, we may justly and profitably endeavor to estimate the amount of truth which our country has contributed to the general mass, and thereby stimulate a generous emulation to augmented efforts, either to supply deficiency, or to achieve or maintain an honorable precedence in the race of improvement. This is all that I propose in calling your attention to the Materia Medica of the United States.

In treating of this subject, I propose, *first*, to give a general view of the medicines which our country has furnished to the world, and of the resources she contains within herself; *secondly*, to speak of the condition of this department of medical science, and of the individuals who have contributed to its promotion within our limits; and *thirdly*, to offer you some inducements to exertion in the further development of our yet hidden or but partially discovered treasures.

If we extend our view to the whole American continent, we have to boast, on this side of the Atlantic, of medicinal resources inferior probably to those of no other section of the globe. Not to mention numerous substances of little importance, we have in the Peruvian Bark the most valuable of all tonic medicines; scarcely indeed surpassed in efficiency and extent of application by any other article of the Materia Medica; in the Quassia of Surinam and the West Indies, the strongest of the pure vegetable bitters; in the Rhatany of Peru, one of the most efficient astringents; in the Ipecacuanha of Brazil, the best of all vegetable emetics; in the Jalap of Mexico, the best vegetable hydragogue cathartic; in the Bal-

sam of Tolu, a good stimulant expectorant; and finally, in Copaiba, and Guaiacum, and Sarsaparilla, medicines of peculiar and valuable properties, such as could not well be dispensed with in the practice of our art, and could not be replaced elsewhere. But none of these substances are found in the United States, at least none of them are furnished to commerce by the soil of our country.

It is indeed singular, considering the extent of our territory, the diversity of its climate, and the vast number of its vegetable productions, that so few medicines from this source have been admitted into the European catalogues of Materia Medica, or even come into general use among our own practitioners. When I have mentioned Lobelia, Sassafras, Seneka, Serpentaria, Spigelia, Toxicodendron or Poison Oak, and Canada Turpentine, I should be at a loss to add the name of another medicine, procured exclusively from the territory of the United States, or to the north of it, which has been introduced to any considerable extent into European practice. It is true that there are several medicinal plants common to North America and the old continent; such as the Bittersweet, Dandelion, Hop, Iceland Moss, Juniper, Pipsissewa, Thorn-apple, and Uva Ursi. But, even with this addition, the catalogue of our indigenous medicines recognised abroad is very meagre; and it is a question of some interest, how it happens that so great a disproportion exists between the extent of our country and its contributions to the general Materia Medica. It is not that our native resources in this respect are peculiarly deficient. On the contrary, as I shall soon have occasion to show, the United States are rich in indigenous medicinal products. But there is a coincidence in properties, real or supposed, between the old standard medicines and many of those of native origin, which has caused them to be applied to the same states of disease; so that the substitution of the latter for the former could afford no advantage sufficient to overbalance the influence of habit in practitioners, their natural want of confidence in untried means, and the various facilities for prescription with which a regular supply of the drug through

established commercial routes, and long settled modes of pharmaceutical management, supplied them. Labor, moreover, is in this country too costly to compete with that which furnishes most of the foreign drugs. We wield the various means of profit on too large a scale, and are too much accustomed to the floods of grain which pour in from vast fields of labor and enterprise, to pay any regard to those dribblets that accrue from the collection of barks and roots. Hence the supply of our indigenous medicines is not such as to enable them upon considerations of economy, to displace those already in use of equal or better understood virtues; and the consequence is that the general demand for them is confined to substances of peculiar properties, such as could not be elsewhere procured. The influence of our national habits of labor upon the commercial value of drugs, is strikingly illustrated in the very great increase in price of Spigelia or Pink-root, since the emigration of the Cherokee Indians, by whom chiefly it was in former times collected and sent to market.

I have said that the United States are rich in medicinal products. This will be rendered obvious by running the eye over a list of the more important indigenous medicines, classified according to their effects upon the system. Under the head of astringents, we shall find the bark of different species of Oak; the roots of the Blackberry, Dewberry, Geranium maculatum, and Heuchera Americana, or alum-root; and the leaves of the Pipsissewa and Uva Ursi. Among these are medicines capable of being employed for any object attainable by means of the class to which they belong, at least of the portion of it derived from the vegetable kingdom. In tonics our country is very rich. It is true that we have no Cinchona; but in the barks of the different species of Cornus or dogwood we have remedies closely analogous, though inferior to it in virtues. Of the simple bitters, the Sabbatia, Coptis, and Xanthorriza might be substituted for Gentian, Quassia, and Columbo. The union of various important properties with the purely tonic, as those of a stimulant in Serpentaria, of a narcotic in Hops, of a sedative in Wild-cherry bark, of a diaphoretic and

emetic in Boneset, renders these medicines of great value; and those of them not hitherto introduced into the Universal Materia Medica highly deserve to be so. I consider the Wild-cherry bark as among the most efficient remedies in the tuberculous diathesis, and not inferior to any other medicine in the treatment of consumption itself. Our catalogue of aromatics is also copious, including, among others, Angelica, Calamus, Sassafras, Hedeoma or Pennyroyal, Common marjoram, Partridge-berry, and Spice-wood or Laurus benzoin. Of stimulants we have Turpentine and its volatile oil; of narcotics, Stramonium and Dulcamara; of antispasmodics, Dracontium and Cimicifuga. Our emetics, if we leave ipecacuanha out of the question, are inferior to those of no other country. Lobelia, though so much much abused by empirics, is possessed of highly valuable properties; Gillenia is supposed to resemble the famous Brazilian root in its action; and Sanguinaria conjoins with its emetic properties others of a peculiar nature, which are said to render it especially useful in certain forms of disease. Among the cathartics, we have substitutes for several of those imported, as in Cassia Marilandica for Senna, in the Extract of Butternut for Rhubarb, and in Podophyllum for Jalap. We are not wanting in diaphoretics or diuretics, and as an expectorant our Seneka holds, in my estimation, the very highest rank. As epispastics we have several species of Cantharis not inferior in virtues to the Spanish fly, and the Cantharis Nuttalli, of the far west, will probably some time come into extensive use; as it is said to be abundant, and has the advantage of equalling if it does not exceed the foreign insect in magnitude. Our native Turpentine and its volatile oil, together with the Hemlock pitch, are good rubefacients; Slippery-elm bark is an excellent demulcent and emollient; and perhaps in no part of the world are there vegetable anthelmintics more efficacious than Spigelia and Chenopodium. In this enumeration I have not attempted to exhaust the whole catalogue of native medicines. My object was only to show that our resources are ample, by calling attention to a few of the more prominent substances, the virtues of which are

known. Besides those mentioned, there are many others which have been more or less investigated, and I have no doubt that some yet lie buried in the mass of our luxuriant vegetation, which will one day be brought to light, to the honor of their discoverers, and the benefit of mankind.

More than fifty years ago, the opinion was advanced by Shoepf that, relying upon their native resources, the Americans might dispense with the greater part if not the whole of the imported medicines. Even at the present time, however, with all the improvement which half a century has conferred upon our indigenous Materia Medica, I cannot coincide wholly in this sentiment. The present standard remedies are for the most part those which have stood the test of ages. They have been gathered from all quarters of the globe, have gone through every variety of trial, and have been sifted out from an immense mass of materials which had been for thousands of years in the course of accumulation. Happy the country which can boast itself the source of one of the more important of these remedies! It will hold a place in the memory of mankind so long as human infirmity shall exist, and, even with no other claims upon our sympathies, will rank among the valued spots of the earth, when countries which derive their importance from mere temporary causes shall have been forgotten. The whole human family will ever look to the Andes with interest and gratitude as the source of Peruvian bark, even though the political clouds which now overshadow her shall deepen into tenfold darkness, and her moral culture become as desolate as her own icy summits. It is not in the order of Providence to lavish on any one region a wealth equal to that scattered over the whole world beside. Not even the microscopic eye of patriotism could magnify our medicinal riches into competition with those of the entire globe. They are, however, very ample: and should political accident ever cut off our supply of drugs from abroad, though we should certainly feel the want of them severely, we should nevertheless be able, in the products of our own soil, to find partial substitutes for almost all that we had lost. It becomes us most care-

fully to cultivate our resources, both that we may be fully prepared against whatever adverse events may occur, and in the hope, moreover, that we may thereby add something new and valuable to the means already existing for the alleviation of human evil.

It is an interesting subject of inquiry, in what manner attention was first attracted to the medicinal plants of this country. When our ancestors had established themselves in their new home, and began to investigate with the eye of curiosity or interest the various novelties around them, it was quite natural that they should at once be struck with resemblances to familiar objects, and should expect a similarity in properties where they found a similarity in appearance. The care of their health no doubt early directed their inquiries towards medicinal products, and plants resembling the simples with which they had been familiar received corresponding names and similar applications. Thus we have our Centaury, our Dittany, our Hellebore, our Pennyroyal, our Senna, our Wormseed, and numerous others so closely allied to the European plants by botanical affinities as to be entitled to the same generic designation, such as the Elder, the Elm, the Oak, the Pine, and the Willow. In this way a domestic Materia Medica was immediately commenced, which gradually increased as substances before unknown were accidentally, or from the possession of certain striking sensible properties, submitted to trial, and found or imagined to operate usefully as medicines. Several substances were also derived from the aborigines, of which the most important are Seneka, Serpentaria, and Spigelia.

It was at one time a general belief that the Indians were in possession of many valuable remedies, and had even specifics for various obstinate complaints which had baffled European skill. These they were supposed to keep secret from some mysterious cause, which acted powerfully on the popular faith by exciting the imagination. A class of empirics took advantage of this superstition, and, under the name of Indian Doctors, spread themselves over the country, imposing their nos-

trums upon the public credulity as secrets obtained from the aborigines, and decrying, with all the zeal of the Thomsonians who have succeeded them, the poisonous minerals employed by the regular practitioners. But faith in the superior medical knowledge of our savage tribes is disappearing with the tribes themselves. The simple truth seems to be, that many of the indigenous medical plants were known and employed, though very unskilfully, by the Indians, who communicated all they knew to the Europeans upon their settlement in the country. Whatever mystery may have, in some instances, been thrown over the subject, was a contrivance of imposture to conceal its real ignorance, or to magnify, through the effect of partial obscurity, its little grain of knowledge into something worthy of notice.

The wants of the country during the war of Independence, when the supply of drugs as well as other necessaries from abroad was very much impeded, stimulated attention to our indigenous resources, and led, if not to the discovery, at least to a fuller investigation and more extensive use of various native medicines.

Another circumstance which contributed very considerably to the cultivation of our native Materia Medica was the regulation formerly existing in this school, which required the publication of the inaugural dissertations of the graduates. A laudable regard to their reputation stimulated the exertions of the candidates, many of whom were induced to extend their researches into the yet but very partially explored region of our native medicines, and were rewarded by discoveries either of new substances, or of new and valuable properties in those already known.

It is due to those who have contributed to bring a fresh soil of knowledge into cultivation, that their names and services should from time to time be revived in the memory of their successors, who are enjoying the fruits of their labors. It is, besides, a healthy excitant of our own exertions, thus to have placed before us the example of useful effort and its just re-

ward of commendation. An account, therefore, of the earlier cultivators of our indigenous Materia Medica may be justly expected from a teacher of that science, addressing those who are to be at once the depositaries of the reputation of their predecessors, and claimants of a like office from posterity towards themselves. I wish to make the proposed sketch as full as the occasion will permit; but it will be necessarily inadequate, and should be filled up by your own further research.

The earliest notices which I have been able to discover of North America medicinal plants are those contained in the Flora Virginica of Dr. John Clayton, published at Leyden by Gronovius in 1739. Dr. Clayton was a native of England, but emigrated early in life to Virginia, where he became eminent as a naturalist and physician, and died in 1773 at the very advanced age of 88 years. Dr. Thatcher states that he published, in the Philosophical Transactions, an ample account of the medicinal plants which he had discovered. It is his name, I presume, that has been enshrined in the botanical designation of that beautiful little spring flower—the *Claytonia Virginica.*

In the years 1743 and 1744 similar medico-botanical notices of plants growing in the province of New York were published in the Upsal Transactions by Dr. Cadwallader Colden, a gentleman of considerable scientific and political distinction, who came from Great Britain to this country about the year 1710, and established himself in that province.

But, perhaps, the most ample of these earlier contributions was that by John Bartram, a native, I believe, of Pennsylvania, who was distinguished as an indefatigable cultivator of botany, and is very favorably remembered in this city as the founder of the Botanical Garden upon the Schuylkill, which has always gone by his name, and is still in the hands of one of his descendants. His essay, containing a description of several medicinal plants of North America, was printed in the year 1756, in the Amœnitates Academicæ of Linnæus, as a portion of a paper denominated *Specifica Canadensium*, pre-

pared by John Von Cölln, and intended to embrace what was at that time known in relation to the Materia Medica of this country.

In subsequent years, various additions were incidentally made to the store of knowledge by writers upon other subjects, as by Catesby in his Natural History of Carolina, and by Kalm, a Swedish gentleman, who travelled in North America about the middle of the last century, and published an Itinerary on his return to Europe.

The first work devoted expressly to the Materia Medica of North America was that of Dr. Shoepf, a German physician, who came with the Hessian troops to this country during the revolutionary war, and remained for some years after its termination, travelling through the different States, and giving an especial attention to the study of plants. After returning to Europe, he published, at Erlangen, in Germany, a treatise in the Latin language, under the title of *Materia Medica Americana*, describing with scientific brevity a great number of our indigenous and naturalized plants, with the shortest possible account of their sensible properties, effects on the system, and medical uses. His work, however, can be of little use to the practitioner; for, though he has introduced everything into it with an indiscriminating appetite, his practical remarks are exceedingly vague, meagre, and unsatisfactory, and even the dose and proper mode of administration are, for the most part, withheld.

A much more valuable practical essay was that of Doctor Benjamin Smith Barton, formerly Professor of Materia Medica, and subsequently of the Pratice of Medicine in this University, whose various knowledge, zeal in the prosecution of natural history, and talents as a medical teacher are still fresh in the recollection of the profession. No one man in the United States, I presume, has contributed so much to the improvement of our native Materia Medica. Not only did he diffuse by his writings and lectures the knowledge which he had accumulated by diligent research, but he breathed a spirit of investigation into the young men who heard him that pro-

duced a rich result of discovery. The work referred to lays no claim to the consideration of a regular treatise, being modestly entitled "Collections for an Essay towards the Materia Medica of the United States," and consisting of materials partly gathered from previous writers, partly accruing from his own inquiries and observation, and thrown together without any great attempt at elaboration. His aim appears to have been to collect into a single repository, of convenient access, facts which might otherwise have been lost, or, from their scattered condition, have remained inaccessible to ordinary research. His book has been a store house of materials for subsequent authors, and will probably continue to be at the fountain head of inquiry; as it contains all that an investigation pushed into the times beyond it would be likely to discover. It consists of two parts, the first of which was published in 1798, and afterwards with some additions in 1801, while the second part did not make its appearance till 1804.

It would be impossible for me, consistently with my present design, to mention individually the numerous inaugural essays and monographs published in the Journals, in relation to particular indigenous medicines. Many of these have considerable merit, and some have been the means of introducing to general notice valuable remedies which have since retained a place in the public esteem. It was soon after the appearance of Dr. Barton's *Collections*, that the attention of students of medicine appears to have been most strongly directed into this channel; for in the year 1802, not less than six Theses on the subject of our medicinal plants were published by alumni of this school, and that out of a class of graduates not exceeding twenty in number.

I do not know that it is strictly in keeping with the plan of this lecture to call attention particularly to the botanical works which appeared about this time and subsequently, and which, though they did not make the medicinal virtues of plants an especial object, nevertheless contain scattered notices in relation to them, of some value to the physician and medical writer. It may, perhaps, be sufficient to mention the

North American Flora of the elder Michaux, which was printed at Paris in 1803, and that of Frederic Pursh, who, after having been diligently engaged for more than twelve years in exploring the botany of this country, either by personal examination of the plants in their localities, or by means of the herbariums of others, published at London, in 1814, his very valuable work.

There is another author whom it would not be just to pass over, without some allusion to his merits in connexion with our subject. I refer to the younger Michaux, whose treatise on the forest-trees of North America, written in French, and published at Paris in 1812, was soon afterwards translated by Mr. Hillhouse into English, and printed at the same place. This is a splendid work, containing a great number of beautiful illustrative engravings, and embodying a vast deal of information in relation to our forest-trees, which, though it bears more especially upon the commercial and agricultural interests, is yet, in many instances, of considerable value in a medical point of view.

We have now come to the period of contemporary writers, in relation to whom prudence would recommend silence; as praise, though deserved, might to over-delicate ears sound like adulation, and censure might be ascribed to envy or the ill-will of opposite interests. Yet if we yield to this squeamish delicacy on the one hand, and to the fear of derogatory imputations on the other, we deprive merit of its best reward —the knowledge, namely, that it is justly appreciated, while impertinent ignorance is allowed to strut about with impunity, and impose its fooleries or knavery upon modest simplicity as the dictates of truth. I scarcely know why I should preface by these generalities the introduction to your notice of two works, which, from an American pen, deserve nothing but praise, and the character of which is so well established, that no commendation which I might bestow upon them would be ascribed to other motives than a sense of justice and patriotic pride. I confess, gentlemen, that I do feel some pride in naming to you the *Medical Botany* of Dr. Wm. P.

C. Barton of Philadelphia, and the *American Medical Botany* of Dr. Jacob Bigelow of Boston, not that these productions offer a claim to the highest rank as works of science or art, but that, considering the materials at command, the state of the arts among us, and the meagre patronage they were likely to receive, the enterprise, industry, zeal, and, I may say, success with which they were executed, and the great advance which they exhibit beyond whatever previously existed here, are calculated to do honor to all of us as fellow countrymen of their authors. The design of their execution appears to have been nearly simultaneously conceived, and they were both published in the year 1817. They consist of descriptions, somewhat ample, of our medicinal plants in all their interesting relations, with colored engravings of these plants, and all sorts of references. It might be invidious to discriminate between them; but if I were to venture an opinion of their relative merits, I should give the palm decidedly to the Philadelphia work upon the score of art and elegance of execution, while that of the Boston Professor might well dispute the precedence on the score of science and research. They have conjointly placed our native Materia Medica on a much higher footing than it stood upon before; and nothing has been subsequently published which could have the least tendency to throw them into shade.

To bring our hasty review down to the present time, we have only to allude to the facts, that in the various treatises upon the general subjects of Materia Medica and Pharmacy, which have appeared in this country, our own medicines have received their share of attention; and that the Journals have continued to contribute occasional articles, either containing new facts, or presenting what was before known in a new light.

There is, however, one circumstance connected with our present subject which it would be improper to pass over wholly without notice; I allude to the chemical analysis of many indigenous medicines, which has resulted in a much more accurate knowledge of their composition, and a juster view of their

pharmaceutical relations than previously existed. The particular results have been consigned to the Journals, and cannot of course be mentioned here; but such of them as are of practical value to the physician will be noticed under the heads of the several medicines in my lectures. We are indebted for them chiefly to graduates of the Philadelphia College of Pharmacy, which appears to have afforded to its students the same stimulus, in their particular pursuit, which was exerted by our own school, at a period of its history already alluded to, upon the candidates for its honors.

In no part of the United States, perhaps, has our indigenous Materia Medica been practically cultivated to the same extent as in New England, and particularly in Connecticut. Several medicines of native origin are, I am told, habitually employed by the regular practitioners which are little if at all used elsewhere; and Professors Ives and Tully, who have successively lectured on Materia Medica in the Medical Department of Yale College, are said to have offered to the student a minuteness and a variety of information upon the physiological effects and therapeutical uses of those medicines, which would be in vain sought for in books. It is to be hoped that the present professor may some time consent to share with his medical brethren in general his peculiar knowledge; for it must be confessed that there is nothing in which we are more deficient than in accuracy and precision of acquaintance with the virtues of most of our indigenous medicines.

It is worthy of mention, in connexion with this subject, that particular attention has been paid to the collection and preparation of indigenous plants by the Shakers, who furnish, indeed, to the shops most of their supplies, and generally in the best condition. An extensive business of this kind is carried on by the Shakers of Lebanon in New York, and, during a recent journey in Ohio, I found that at their settlement in that State they were cultivating the same source of profit.

Our view has hitherto been confined to the state of Materia Medica in relation to the objects of that science furnished exclusively by this country; we are now to consider the history

and condition of the science in its general relations among us. A few words will embrace all that need be said on this subject; for the history of Materia Medica in the United States has been, till within a few years, identical with that of the same branch of knowledge in Europe. While we were colonies of England, we were willingly indebted to the mother country for intellectual supplies as well as for manufactures, and, considering our credit as involved in hers, did not seek an independent national reputation. Our medical doctrines and modes of practice, the choice of remedies and their modes of preparation, even the medicines themselves and all their pharmaceutical modifications, were received from Great Britain with a filial respect which did not allow us to suspect the possibility of anything better or more applicable to our condition. Her authorities were our authorities, her books were our books, and in great measure her physicians were our physicians; for the great west was then the Atlantic border, and the young medical men from the mother country found a welcome as cordial as that now extended, on the banks of the Mississippi, to the alumni of our own schools. Nor did our professional cease with our political dependence. For many years after we had thrown off the yoke of the mother country, we continued to look to her authors almost exclusively as our guides in medicine. So far as concerns the Materia Medica, the first effort to supply ourselves was in the publication, in 1806, of the American Dispensatory by Dr. John Redman Coxe. This work was little more than a reprint of the Edinburgh Dispensatory, with an alteration in the arrangement of the articles, and the introduction of some notices in relation to our indigenous medicines. Such as it was, however, it acquired great celebrity, passed through numerous editions, and for many years was the almost exclusive pharmaceutical guide-book of a great portion of the Union. In 1810 appeared the American New Dispensatory by Dr. Thacher of Massachusetts, which, with greater claims to originality, was scarcely less meritorious in other respects than its predecessor, and had the advantage of presenting more elaborate

and better digested accounts of our native medicines than had yet appeared in any one work. This soon divided with Dr. Coxe's book the patronage of the country, circulating more especially in the Eastern States, though it also penetrated into a few shops and libraries in the more southern sections.

In the year 1817, a new era in the history of our science in America commenced with the publication of Dr. Chapman's work on Therapeutics and Materia Medica. Hitherto we had done little more than add to the products of the European press our peculiar knowledge in relation to indigenous medicines. Dr. Chapman took a bolder flight; and by the publication of a systematic and original treatise, containing elaborate doctrine, interesting practical views, and highly important therapeutical facts of a general character, placed us at once upon a footing with English authorship in this department of medicine. If his work be considered rather in reference to the physiological effects or practical application of medicines, than to their history as objects of physical science or pharmaceutical management, though, as they who have attended my lectures well know, I cannot coincide in all the opinions which it advocates, I can with sincerity say that I know of nothing superior or equal to it among the treatises on Materia Medica in the English language existing at the time when it was written. The work of Dr. Chapman was followed in 1822 by the Materia Medica of Dr. Bigelow, and in 1825, by the Materia Medica and Therapeutics of Dr. Eberle. The former was intended as a sequel to the Pharmacopœia of the United States, of which it may be considered as an explanatory commentary, without claiming to rank as a finished treatise upon the science. The latter is an elaborate work, prepared with great industry and research, and containing much very valuable information. I should not be doing justice to the student without recommending to him, especially in the intervals of his winter labors, the diligent perusal of Dr. Chapman's and Dr. Eberle's treatises.

Of the work which came next in the order of time it does not become me to speak except in the most general terms. The United States Dispensatory, which has been adopted as the text-book of the ensuing course of lectures, made its first appearance in 1833. I may, perhaps, be permitted to say of that portion of the work executed by my friend, Dr. Bache, which concerns for the most part the chemical articles, that it is marked by all the scrupulous accuracy, precision, and faithfulness, which so favorably characterize the author in all his relations.

To complete the list of American works upon Materia Medica, it remains only to mention the "New Remedies" of my friend and co-laborer in this field of medicine, Dr. Dunglison, which was published in 1839. This is a valuable treatise, containing much information in relation to new or little employed remedies, and might advantageously lie on the table of every practitioner, with a view to occasional reference.

Having seen what has been written upon the subject of which we are treating, we are naturally led to the inquiry, what has been done or discovered in this country towards the advancement or improvement of the science of Materia Medica, independently of the additions it has received from our indigenous products. The amount of our contributions in this way is not large. Most medicines have been so long subjected to all sorts of trial, in every variety of disease, that to fall upon a really new physiological property or therapeutical application is a rare occurrence; and even where an individual may imagine that he has made some interesting or important discovery, the chances are great that it is a long known and recorded fact, of which he was ignorant from deficient means of information. In the short annals, therefore, of our independent medical history, we are to look for very few improvements of the kind alluded to. Still, by running our eye over the medical Journals we shall find that our soil has not been entirely barren. From among the great mass of suggestions and reported experience, a few facts might be picked

out here and there which have the stamp of novelty. You will observe that I am now speaking of the general Materia Medica, exclusive of that which is the peculiar product of our native vegetation, and in which our contributions have been ample. To mention each individual case in which an old medicine may have received a new application at our hands, would be out of place on this occasion. Such notices belong to the special history of medicines, and will be introduced into my lectures under appropriate heads. There have, however, been two discoveries of American physicians which merit particular notice, as they have been the means of introducing, out of the mass of materials everywhere accessible, new and effective remedies into general use. One of these discoveries is that made by Dr. Coxe, of virtues analogous to those of opium in the inspissated milky juice of Lettuce, which has consequently been introduced into the officinal catalogues both here and in Europe, under the name of Lactucarium; the other is that by Dr. Stearns, of the State of New York, of very peculiar and highly important properties in Ergot, which have led to its universal adoption as an article of the Materia Medica.

There yet remains another point of view from which to consider the Materia Medica of the United States. In every civilized country of Europe it has been considered indispensable, in order to a due regulation of the nomenclature and preparation of medicines, to establish a system of rules, which should have the sanction of law. Without the uniformity resulting from such pharmaceutical codes, no physician could depend on obtaining from the apothecary the same medicine or preparation under the same name, and infinite confusion with its consequent mischief would result. These codes are put forth, under the title of Pharmacopœias, by colleges or other authorized bodies, and having the sanction of the government, constitute a part of the public law. Thus the Pharmacy of England is regulated by the London College of Physicians through their Pharmacopœia, that of Scotland in like manner by the Edinburgh College, and that of Ireland by the

Dublin College. In this country we were long without any such generally recognized code; and the preparations were made according to the directions of one or another of the British Colleges at the discretion of the apothecary, or even according to some favorite recipe of his own; so that compounded medicines of the same title were often entirely different in different sections of the country, and even in different shops of the same town. The first effort to remedy the evil of which I have any knowledge was made in 1808 by the Medical Society of Massachusetts, by which measures were taken for the preparation of a Pharmacopœia, which was published, and was afterwards adopted by the Medical Society of New Hampshire. But no general movement took place till about the beginning of the year 1820, when a Convention of Physicians, from various parts of the country met at Washington, and framed a Pharmacopæia which was intended to express the sentiments of the profession throughout the Union, and thus to acquire an authority which we have not the means of conferring on such a work by law. It was denominated the Pharmacopœia of the United States, and was received, to a considerable extent, as the pharmaceutical standard of the country; but its many defects and errors, such as are incident to a new undertaking, and especially to one in which numerous irresponsible hands are engaged, prevented its universal acceptance. Provision, however, had been made for the supply of these deficiencies by a revision at the end of ten years. Accordingly, in January, 1830, a second Convention met at Washington, by whose authority a revised and very much amended edition was published. This has been subsequently admitted by the country in general as an authoritative pharmaceutical code, though, in the absence of any legal sanction, it has not been altogether sufficient to restrain propensities to independent action on the part of individuals. In order to render the work still more worthy of the place which it claims to occupy, as well as to bring it up to the present level of our knowledge, a third Convention, which met at the commencement of the present year in Washington, provided for another

revision, to the aid of which the Colleges of Pharmacy were invited, so that the practical and peculiar skill of the apothecary might be brought into co-operation with the knowledge of the physician. This aid has been secured, and the Pharmacopœia has been submitted to a thorough examination, which it is hoped will end in such an improvement as to render it generally if not universally acceptable.

I have alluded to the Pharmaceutical Colleges. It is not inappropriate to the occasion to state, that these institutions, of which one has been in efficient operation in Philadelphia since the year 1822, and another, subsequently founded, is now in operation in New York, have contributed very greatly to improve the art of preparing medicines in this country, and, by elevating the profession of Pharmacy, have rendered it a much more efficient auxiliary to ours. The late Convention at Washington has, I think, merited well of the country in inviting the co-operation of these Colleges in an important national work, in which both professions are equally interested, and which can scarcely be satisfactorily completed unless by their joint labors.

And now, gentlemen, having conveyed you through a brief history of the Materia Medica in this country, will you allow me to urge upon you the application of your own efforts to the improvement of this branch of medicine, and especially of that portion of it which concerns our indigenous products. I know no fairer field than this in which to gain a name for yourselves, or accomplish something useful to your profession. Success would be doubly grateful to a patriotic spirit; for while your country would share in the honor which might accrue to one of her sons, she would enjoy the advantage also of a cultivation of her own peculiar resources. Can I not paint to your fancy a prospect which will rouse all your energies to realize it? Suppose that by a careful and laborious investigation, by a long course of varied experiment and accurate observation, you have arrived at the discovery of some valuable medicine hitherto concealed in the wilds of our country, or of some yet unknown peculiarities and powers of a

medicine already recognised? Your name is at once honorably known in connexion with your discovery; through life you will have the consciousness that you at least are not among those who pass undistinguished along their destined course, and leave no trace behind them; your children and your children's children will inherit the imperishable treasure of your reputation. In the pages upon which succeeding generations of students will dwell, your name will be connected with the record of the good that you have accomplished; in the lectures to which future aspirants for medical honors will listen, your claims will not be forgotten when your discovery is alluded to; perhaps from this very spot, some future Professor, giving, as I have done to-day, a history of the Materia Medica of our country, may cite your example as an honor to the Institution, and a powerful incentive to his pupils. It is something also to possess the consciousness that you have added to the credit of your profession, and have been a benefactor to your country and to mankind. These, it is true, are motives of action common to every honorable field of exertion; the peculiar inducements in that now offered to you are the deficiency of present culture, and the greater probability of a rich return for all the labor expended. Our native Materia Medica may be said to have lain fallow for several years. Pathology has by its fruitful yield drawn almost all floating labor to itself; and fashion has invested it with additional attractions. Our comparatively neglected science has, in the meantime, through the progress of general discovery, been accumulating renewed fertility, and will yield abundantly to properly directed culture. May I not hope that some of you, under the inducements which I have presented, or others which your own minds may suggest, will engage heartily in this work of investigation, in the pursuit of the high prize of honor for yourselves, your school, your profession, and your country?

But you must remember that such a prize is not easily won. We cannot guess ourselves, nor dream ourselves into honorable distinction. The pursuit of a creditable name is no lot-

tery in which the highest prize may be drawn by careless indolence, or self-satisfied ignorance. You must work, if you would gain the wages of labor.

Having thus called you to exertion, I may very properly be required by you to point out the best plan of beginning and conducting your investigations. Your first object will be to select some particular subject of inquiry. You may choose some indigenous plant, whose medicinal properties have already attracted the notice of the profession, but have not been thoroughly studied; or you may search amidst the rubbish of popular and domestic practice, and find something perhaps of value which has hitherto lain concealed; or, finally, you may examine the plants of our woods and meadows, and guided by the odor, taste, or other obvious property indicating some power of affecting the human system, may perchance be led to the discovery of a useful and hitherto unknown medicine. I would recommend the first course; as the catalogue of officinal or semi-officinal plants is already numerous, and it is desirable to sift this thoroughly before attempting to augment it.

In the very beginning, you must take care to avoid the too common error of explorers, of determining at all events to find something new—a determination which is apt to deceive the fancy into the belief that it has discovered what it has in fact only invented. Let your search be after truth, and nothing but truth. It may be as important to deprive a counterfeit medicine of its false credit, as to add a new one, though genuine, to the mass of circulation. You will perform an important service, if you can prove satisfactorily that one of the received medicines is quite valueless.

Having selected the subject of experiment, you are first to ascertain its effects upon the human system in health. Try it upon yourselves, upon your friends, upon persons of different sex, age, and temperament, beginning with doses which you know to be safe, and gradually increasing till its activity or inertness is evinced. Ascertain its influence upon the brain and nervous system, upon the stomach and bowels, upon the

heart as indicated by the pulse, upon the temperature of the body, upon the secretions, and in fine upon all the healthy functions. Note all these effects carefully as you observe them; but at the same time be very cautious not to confound those changes in the system which may result from mental influence, or from the operation of ordinary or accidental causes, with those which are the genuine product of the medicine. Do not be satisfied with a single trial in each case, but repeat it with varying circumstances till there can no longer be a doubt of the actual effect produced.

When you have sufficiently convinced yourselves of the efficiency of the medicine, and ascertained its peculiar physiological action, you are next to apply it to the treatment of disease; and here the same caution is requisite not to allow yourselves to be misguided by the influence of various disturbing agencies, nor to make hasty conclusions from one or a few trials. There is nothing in relation to which we are more apt to draw false inferences than the action of medicine in disease. Most complaints have a tendency to spontaneous cure, and will in general go on sooner or later to recovery, without the use, and often notwithstanding the use of medicine. In such cases, the last drug administered is apt to have the credit of the cure, though all its operation may have been to protract this result. There are a thousand causes which operate on the system in disease giving rise to changes not anticipated, which, without due caution, may be ascribed to the remedies employed. Against all these sources of error you must be on your guard, and above all against your own hopes, which will act powerfully in causing you to see things as you wish them.

Other points which will require investigation are the part or parts of the plant most effective, its relations to the usual menstrua employed in pharmacy, as water and alcohol, the best mode of administration, and the dose. Its composition and general chemical relations are also important objects of inquiry; but few medical men, and none who have not devoted an especial attention to practical chemistry, are capable of

conducting successfully those complex and delicate processes which are essential to accurate analysis, especially of organic products. This part of the investigation may, therefore, with propriety be left to the pharmaceutical chemist, within whose province it strictly falls.

To complete your work it will now only remain to record the results of your investigations. In doing this, your rule should be to put down everything exactly, plainly, and in as few words as possible consistently with perfect clearness. Your object will not be to produce an impression by means of rhetoric, but to establish facts in science: and these are always most striking in their native simplicity. We suspect the purity of truth herself, when she is disguised in meretricious ornament. You should endeavor in your narrative to present to the reader, in their proper order, all the materials for forming a judgment of which you may be yourselves in possession, and thus enable him to come to the conclusion you desire, perfectly satisfied of its correctness. No matter whether your inquiries have ended in the discovery of some new fact, or the refutation of some old error; in either case the result is truth, and the process by which it was attained is equally deserving of record. But be not in haste to publish your essay after you have prepared it. An author is seldom a good judge of his own productions when immediately from his pen. He views his offspring with a paternal, I might, perhaps, be allowed to say, with a maternal eye, which can see no defects, and often finds beauties when indifference would discover only deformity. Lay aside your manuscript for a time; let the ardor of composition cool, the pains of your mental labor be forgotten; you will then be able to judge of your own production more as a critic than as an author; and you may depend upon it that you will find much to amend, and rejoice that you have yet the power.

I have thus, gentlemen, accomplished the object which I proposed at the beginning of the Lecture. Much more might have been said on almost every point, and perhaps not un-

profitably, had time and space permitted; but in this world of limited power and limited opportunities, one great secret of doing well is to take a just view of the power and opportunity we actually possess, and adapt our aims and efforts accurately to them. This at least I endeavor to make a rule of action for myself; and you will find me governed by that rule in the subsequent Course of Lectures. We have only a certain amount of time allotted to Materia Medica. In arranging my course I have endeavored to find the just proportion between the importance of the several topics and the whole time, and to devote to each topic its due share of consideration, so that none may be entirely neglected. If I am thus induced to say less than lecturers often do upon certain prominent subjects, I have at least the advantage of giving some attention to others, which, though severally less important, are much more so in the aggregate. My great object is to give the pupil opportunities for acquiring such a knowledge of principles and facts as may serve as a basis to his own future labors. To render these opportunities available, your zealous co-operation will be requisite. Judging from the experience of the past, I have no doubt of such co-operation. I have not yet had occasion to complain of the want of due attention on the part of a class, and entertain no apprehension that, at the termination of the present course, I shall have cause to express a different sentiment. Should my efforts equally content your reasonable wishes, my highest ambition will be satisfied.

ART. LX.—SOLUTION OF IODIDE OF IRON.

By William Procter, Jr.

At page 13th of the present volume, a process was detailed for preventing the decomposition of solution of iodide of iron, by the addition of saccharine matter. Several who have employed it having stated objections, it was found on inquiry that either sugar or impure honey had been used in its formation. The paper above alluded to says, that either *sugar, uncrystallizable honey, or uncrystallizable sugar* may be used, but expressly gives the preference to the two last, as having the most power. Honey, when *properly prepared*, owing to its light color, is preferable to molasses. The object of preparing it is to deprive it of acidity, as well as color. The following formula, recommended by the committee of the Philadelphia College of Pharmacy, on the U. S. Pharmacopœia, is an excellent one, and yields a product that fully answers the proposed end.

Take of	honey	Oss.
"	diluted alcohol	Oj.
"	prepared chalk	℥ss.

Mix the honey with the diluted alcohol, add the prepared chalk, agitate them well together, and heat the mixture till it boils—then filter, and by means of a water bath, evaporate the clear solution to the consistence of honey.

By pursuing this method for the preparation of the honey, this unstable preparation of iron is rendered permanent.

Note.—In the tenth volume, page 274 of this Journal, was published an article exhibiting a new process for the preparation of tincture of muriate of iron. In copying the paper, an error was made by which the quantity of tincture directed to be formed with two ounces of hydrochloric acid was *nineteen ounces*, instead of *nine and a half* ounces, the correct quantity. Those who were subscribers to the Journal at that time will please to note this fact, at the page where the error occurred.

ART. LXI.—SOME OBSERVATIONS ON THE AQUEOUS SOLUTION OF CARBONATE OF MAGNESIA, WITH EXCESS OF CARBONIC ACID, AND ON THE SALT WHICH IT AFFORDS BY SPONTANEOUS DECOMPOSITION. By JOHN DAVY, M. D., F. R. S.

I HAVE been induced to institute some experiments on the solution of carbonate of magnesia, in water strongly impregnated with carbonic acid gas, in consequence of the high repute, on very questionable grounds, which it has lately acquired as a medicine.

The solution I have used, is that prepared and sold by Mr. Dinneford, of New Bond street, with the designation of Dinneford's Solution of Magnesia, and with the following recommendation on the label: "The great advantages of this elegant preparation are, that being in a *fluid* state, and possessing all the properties of magnesia in general use, it is not likely to form dangerous concretions in the bowels; it corrects acidity and heart burn effectually, without injuring the coats of the stomach, as carbonates of potash and soda are known to do; it prevents the food of infants from turning sour, and in all cases it acts as a pleasing aperient particularly adapted to females."

Such a recommendation I should not have thought it right to notice, were it an ordinary quack eulogy, and unsupported by certificates given by respectable medical men; and moreover, were I not assured that great faith is placed by many persons in the asserted virtues of the preparation, and that the use of it is rapidly extending.

The first trials I subjected the medicine to, were made with a view to test the permanence of the solution; as by exposure to the air, in an open vessel, exposure to a temperature of 100° F., in a vessel loosely corked, and to the action of an air pump under an exhausted receiver.

The result in each instance was very similar; carbonic acid

gas escaped, or was expelled, and a salt was deposited in the form of minute prismatic crystals.

This separation of magnesia in a solid form, on the disengagement of the excess of carbonic acid, was no more than might have been expected from the known nature of the compound, and the artificial manner in which it is formed by the condensation of the gaseous acid; and must be considered as quite incompatible with the declaration of its "fluid state" in the stomach and bowels, and sufficient ground to call in question the propriety of placing confidence in the preparation, as a medicine, in preference to common carbonate of magnesia or calcined magnesia, than either of which it is so much more costly an article.

The prismatic salt deposited on the escape of the excess of carbonic acid, has been examined by several chemists; resting chiefly on the results of the experiments of Berzelius, and the late Dr. Henry, it has been considered as a hydrated carbonate of magnesia, composed as follows, viz.

29.61 Magnesia.
32.23 Carbonic acid.
10.27 Water expelled at 212° F.
27.90 " " by a higher temperature, as by ignition.

100.00

or of one proportion and half of magnesia, and carbonic acid, one of water expelled at 212°, and three proportions of water expelled by a higher temperature. Compared with the common carbonate of magnesia, from results which I have obtained operating on the latter, this appears to differ chiefly from the former in possessing a half proportion more of magnesia, and one proportion less of water, being composed of

41.52 Magnesia.
33.31 Carbonic acid.
17.47 Water expelled at 212°.
7.70 " " at a higher temperature.

100.00

These results accord tolerably with those of other inquirers who have examined this compound ; the variation or want of perfect accordance, probably chiefly depends on the degree of dryness of the preparation examined, or on the quantity of water retained in the powder admitting of expulsion at 212°, which water, being hygrometrical, at least in part, must vary in the degree of dryness of the atmosphere to which it is exposed.

The method by which these two compounds of magnesia and carbonic acid were analysed, was a simple one, admitting of considerable accuracy.

The quantity of water expelled at a temperature of 212°, is determined by exposure of an hour or more to the heat of a steam bath ; the quantity of carbonic acid, by acting on the compounds, very carefully weighed by muriatic acid, saturated with carbonic acid over mercury in a graduated tube ; and the quantities of magnesia and of water expelled at a higher temperature than 212°, by the action of a red heat, continued for two or three hours, till no further loss of weight was produced by a continuance of the high temperature. In estimating the proportion of carbonic acid, the calculation was made on the ground that 100 cubic inches of this gas weigh 47.262 grains.

A few words relative to the properties of the first-mentioned carbonate. Its tendency to crystallize is remarkable ; however obtained, even when rapidly separated by the expulsion of the excess of carbonic acid by heat, it has been deposited in a crystalline form. This form is not obvious to the naked eye, but, when the powder is examined by the microscope, each particle is found to be a distinct prismatic crystal. And the persistence of this form is no less remarkable ; it is not destroyed by decomposition ; the powder after ignition, after the expulsion of the whole of the water and carbonic acid, under the microscope shows no alteration ; each particle is still prismatic, and, when moistened with water, is transparent.

It is asserted that this carbonate readily loses the water with

which it is combined. In a dry atmosphere it looses a portion of the water, which may perhaps be considered as hygrometrical, and at the same time loses its transparency ; but I find, as has already been remarked, that a temperature of 212° expels only one portion, and that a high temperature is requisite to expel the three remaining proportions, and which are probably the strictly chemically combined water.

It is also said that this compound is altered by the action of cold water, and by boiling water; that, in one instance a solution of bicarbonate of magnesia is formed, and an insoluble carbonate containing a smaller proportion of carbonic acid ; and in the other, that the same insoluble subcarbonate is produced, but without the solution of bicarbonate, the proportion of carbonic acid required for this being expelled in the form of gas. The results of the trials I have made have not confirmed either of these conclusions. It has appeared to me to dissolve both in hot and in cold water without undergoing any decomposition. I have not been able to obtain an insoluble subcarbonate of magnesia by acting on the prismatic salt by cold water, or carbonic acid gas from it by boiling water,—for instance, boiling it in distilled water in a retort connected with a mercurial pneumatic apparatus. It is true, that when this carbonate is thrown into hot water, there is a disengagement of air, but the air is common air mechanically entangled, not carbonic acid gas which had been chemically combined.

Both the hot solution and the cold, on evaporation, yielded the prismatic compound. 1000 grains of water at the temperature of 60°, appear capable of holding in solution about 4 grains ; thus 326.6 grains of the solution of the carbonate after the excess of carbonic acid had been expelled by the air-pump, afforded, on spontaneous evaporation, 1.5 grain of crystalline salt.

Whether this slight degree of solubility can be useful, considering the qualities of the compound as a medicine, or whether the crystalline spicular prismatic form which it assumes on separation of the excess of carbonic acid by which the carbonate was brought into solution, can be injurious to the coats

of the stomach, as a mechanical irritant, it is far from easy to determine; the probability is, reasoning analogically, that neither the one or the other circumstance, medicinally considered, is of much consequence.

Edin. Lond. and Dub. Phil. Mag.

ART. LXII.—NOTICE OF CHELIDONINE AND PERROPINE.

M. Polex has found in the root of the *Chelidonium majus*, a true alkaloid (chelidonine) and a sub-alkaloid, (perropine,) a principle analogous to narcotine and narceine, and to which the juice owes its color. On distilling this plant with its root at the time it was in flower, either with or without an alkali, products were obtained having the narcotic odor of this vegetable.

In the acid product of the distillation without alkali, formic and acetic acids were manifest; that obtained by the addition of potassa contained ammonia.

Preparation of these two Alkaloids.

The dried root of the Cheledonium majus is reduced to powder and boiled with two portions of alcohol. These infusions were distilled, and to the residue an equal weight of water added, and the remainder of the alcohol separated by distillation. From the remaining solution, when thrown into an evaporating dish, and completely cold, a soft resin is set free; this is separated by the filter, and the two alkaloids precipitated by carbonate of soda. The precipitate is collected on a filter and washed with cold water, and then dissolved in boiling alcohol of 84°, and the solution allowed to cool. Proceeding thus, the greatest part of the chelidonine crystallizes, and the remainder on evaporation of the alcohol. The crystals are to be washed with alcohol, to separate any extractive. The mother water and the washings are evaporated at a moderate

heat, on which the pirropine crystallizes with a little chelidonine, in yellow plates, and a part is deposited on the sides of the vessel in blackish discs.

It is well to remark, that we should not operate on a very small quantity of the root, because the proportion of pirropine is very small. The greater part shows itself with an aqueous or resinous extractive; this latter dissolves in weak acids and is precipitable by the alkalies, but is not crystallizable; it is combined more particularly with the soft resin, and forms with it, together with chlorophylle and a fatty matter, so intimate a union that it is difficult to separate them. It appears that pirropine is found especially in the old roots. In the root and whole of the young plant, in the yellow lactescent juice, it is particularly united with aqueous extractive.

Properties of Chelidonine.

Chelidonine crystallizes partly in tables and partly in cubes, and its variations. In the crystalline state it dissolves with difficulty in alcohol and in hot ether; from which it crystallizes on cooling. Concentrated acids, even with heat, act slightly upon it; nitric acid colors it yellow, and sulphuric black. Weak acids form with it colorless salts, which readily crystallize, and have an astringent and very bitter taste. Chelidonine dissolves easily in the fixed and volatile oils, by the aid of heat, and the solutions have a bitter taste.

Its alcoholic solution exhibits an alkaline reaction. If to a solution of the acetate of chelidonine, tincture of galls, or solution of subacetate of lead be added, abundant white precipitates are produced. Tincture of iodine produces a precipitate the color of kermes. Chromate of potassa precipitates it of a deep yellow, and chloride of gold of an obscure reddish yellow; the alkalies white, &c.

Properties of Pirropine.

Pirropine crystallizes in stars formed by the union of colorless, transparent prisms. By cooling, they lose their trans-

parency and become brownish. Acids act slightly on them when cold, but with heat dissolve them—assuming a golden yellow or reddish color. If these crystals are in contact with a strong acid, they likewise become of a fine fiery red. These combinations are, for the most part, but little soluble in cold water, and have a taste but slightly bitter, but acrid and pungent.

Pirropine dissolves with difficulty in cold ether or alcohol, but readily when boiling. The fixed and volatile oils dissolve it by the aid of heat. Exposed to heat it fuses, burns and gives off ammoniacal vapors. Tincture of iodine precipitates the acetate of pirropine of a crimson color; chloride of gold of a brownish yellow; chromate of potassa, of a deep yellow, tartrate of antimony, chloride of iron, protonitrate of mercury, bi-chloride of mercury and nitrate of silver of a yellowish white. Alkalies produce a white precipitate. Tincture of galls, and subacetate of lead, effect no change. The alcoholic solution does not exhibit an alkaline re-action.

J. de F.

Journ. de Chim. Med.

ART. LXIII.—GRANATINE. By M. Landerer.

This chemist has obtained this substance by exhausting with several portions of alcohol, the rind of the unripe fruit of the pomegranate. The alcoholic extract is bitter and very astringent. This is dissolved in water, and albumen added to separate the tannin; the liquor is then filtered, evaporated, and treated with weak sulphuric acid, which forms a very bitter solution, from which caustic alkali throws down an abundant precipitate. This precipitate was dried, and subjected to dilute hydrochloric acid, which dissolved a part; the remainder was then dissolved in alcohol, from which was obtained crystals partly stelliform, and partly mammelated, in the proportion of five grains from five pomegranates.

This substance, heated in a platina crucible, burnt with the odor of burnt bread, it dissolves in all the diluted acids; with concentrated nitric acid it becomes blood red, and gives rise to a substance of the nature of wax.

We do not consider these details as sufficient to characterise perfectly this substance, and to assign the rank which it ought to hold.

J. de F.

Journ. de Chim. Med.

ART. LXIV.—UPON A PALE CINCHONA OF BAD QUALITY FOUND IN COMMERCE.

This bark is that of the *Cinchona ovata* of the *Flora Peruviana*, it does not exist generally in commerce, and is found but rarely mixed with Loxa Bark.

It is without doubt the high price of the Cinchonas, which has occasioned the introduction into the market of this bad quality of bark. Many parcels of it have been already sold, and we have been informed that the central Pharmacy has been furnished with fifteen or sixteen seroons.

The bark of the *Cinchona ovata*, has been examined by M. Manzini, pharmacien interne to the Hotel Dieu, who has described its characteristics. M. Bouchardat, has made an analysis of it, and has obtained from it neither quinia or cinchona. A committee of the Academy of Medicine has been entrusted with its examination, and at some future period we shall make known the result of their labor.

This cinchona, as it ought not to be employed for any of the pharmaceutical preparations which are employed, either powder, wine, syrup, extract or tincture, should be rejected by every conscientious pharmacien. According to M. Manzini, it bears in Peru the name of *quinquina jean*, and is designated by the natives by the application of *Patte de Canard;* it is employed to mix with the good cinchonas.

It has a yellow color, mixed with gray and pale yellow, it is very light, its internal surface is of a deep reddish color and covered with powder. Its odor is feeble; its taste at first a little bitter, soon becomes developed, and is followed by a little astringency. The powder is of a pale brown cinnamon color.

The difficulty which exists of recognising the cinchonas, leads us to urge the necessity of establishing the practice of entrusting their sale to particular individuals, possessed of sufficient skill to determine positively the value of each, and who, in case of doubt, should make an analysis of a suspected bark.

It may be alleged that this method would be too restrictive for trade, but it may be advanced that the public interest should be of paramount importance, and that such precautions are necessary, that the numerous patients who employ the cinchonas may not be injured by them.

It is desirable that the cinchonas brought to France should be examined by commissions, who will classify them according to their value, and who will reject those which ought not be employed. These commissions to be composed of persons who have given proof of skill, and are familiar with the different species of bark. A. C.

Journ. de Chimie Medicale.

ART. LXV.—NOTE UPON A SUBSTANCE OF FOREIGN ORIGIN RESEMBLING MYRRH, AND THE PECULIAR PRINCIPLE CONTAINED IN IT. By M. Planche.

Naturalists are still in doubt with respect to the particular plant which produces myrrh, although this gum resin has been employed from the earliest antiquity, either as a perfume or as a therapeutic agent. Better informed as regards the intimate composition of this immediate product by the labors of Cartha, of Neuman, of Braconnot, of Pelletier, and more recently by the analysis of Brandes, whose results most nearly approach those of our learned compeer; sufficiently instructed on the other hand, upon the nature of a new or false myrrh, examined in 1829, by M. Bonastre, we find two points of departure sufficiently well established to determine in what the new substance, with which we are about to occupy ourselves, is analogous to common myrrh, and in what it differs from it.

This substance made part of a collection which I obtained, about two years since, of an old druggist of Paris, and which he had picked himself from a case of myrrh, so fully

persuaded was he that the samples separated were of the purest kind. The resemblance to certain samples of this gum resin, must in fact have been exceedingly close, for a dealer, as habituated as he was to see daily the drug, to be so deceived. Of forty pieces which I tried, thirty-five were found to be false myrrh, and I confess, that on my own part, I shared with him the mistake, and should have still continued in it, had not a peculiar circumstance led me to examine matters a little more closely.

Destitute as I am of all idea of the origin of this natural product, I shall designate it in anticipation by the name of myrrhoid, because it is especially from its form that it possesses a resemblance to myrrh, and moreover in order to distinguish between it and other myrrhs which are false or pretended to be such.

This myrrhoid presents itself like myrrh, in tears of an irregular shape, some mammaleonated or striated of a yellow color, somewhat opaque and covered over with a grayish powder; these are most numerous; others, of a reddish brown, are more transparent, exhibit a vitreous fracture, and externally are less rugose than the preceding. Myrrhoid, which has for a long time been in contact with true myrrh, retains a little of its odor, but it becomes inodorous, if after having brushed it to remove the powder, we plunge it into feeble alcohol, and expose it for a few days to the open air.

This myrrhoid has a bitter, disagreeable taste, to a certain extent resembling that of myrrh, but is very acrid and a little pungent; a taste which remains for a long time in the fauces; its powder is inodorous, of a yellowish white color.

Action of water upon the myrrhoid.

A portion of this substance in powder, rubbed up with fifteen parts of water in an agate mortar, afforded an almost transparent solution, very little colored, from which there was separated by repose a soft substance, of a yellow color, B, which could not be dissolved in a new portion of cold water. When precipitated, it formed about the $\frac{3}{100}$ of the myrrhoid;

and we shall see, further on, when speaking of the direct action of alcohol, that it exists in it to a greater amount.

One part of the myrrhoid in powder (100 grains) triturated in an agate mortar with two parts of water, (200 grains) afforded an opaque mass, of the consistence of mucilage, homogeneous in its consistence, which was mixed by trituration with about thirty parts of cold water; the liquid still transparent, and very little colored, in a short time exhibited a multitude of small oleaginous drops, which at last became united in masses at the bottom of the vessel, having the appearance of a resinous liquid, to which we shall return directly, and which resisted solution in a large quantity of boiling water.

Above it, was held in suspension another matter, very light, very voluminous, giving to the liquid the appearance of a thinner solution of gum tragacanth; it has been impossible for me to determine the proportion of it, inasmuch as by desiccation it was reduced, so to speak, almost to nothing. This substance, morever, appeared to me analogous to tragacanthine.

In place of rubbing the myrrhoid in powder with water, it was allowed, in substance, to remain tranquilly in water for ten or twelve hours; the solution did not take place as above, but instead of the small portion of insoluble matter uniting itself in soft mass, it presents light flocculi floating upon the liquid, when it is agitated, and separating when allowed to stand. It may be remarked, in passing, that myrrh when placed under the same circumstances presents a different action. The aqueous solution of the myrrhoid is very bitter and acrid; it sensibly reddens litmus paper. It is troubled by alcohol, and precipitates in white flocks, leaving the supernatant liquid perfectly clear and colorless. It is rendered equally cloudy when exposed to heat or the solar rays, and preserves its opacity to the end of the evaporation, leaving a yellow matter, dry and translucent, which again forms with cold water a limpid solution. This aqueous solution of the myrrhoid is formed almost entirely of a peculiar matter, which we shall designate by the name of *Myrrhoidine*.

The resinous matter B, as we have separated it mechanically, is united with a certain quantity of water, which causes it to be in the state of a hydrate. In this state, it is insoluble in a new quantity of cold or boiling water; it obstinately preserves, in spite of repeated washings, the acrid and bitter taste of the substance when entire; it is soluble in five times its weight of absolute alcohol.

This matter B, insoluble in cold water, was dissolved in alcohol. This solution, much diluted with water, was not rendered cloudy; allowed to evaporate, it remained transparent; then, in proportion as the evaporation advanced, the oleaginous drops were perceived floating upon the liquid, and assuming a consistence in appearance resinous, when they were attached to the dry sides of the capsule.

Dissolved in five parts of absolute alcohol, this matter resumed, when water was added to the solution, the form of transparent drops, the mixture not appearing clouded, but rather presenting the appearance of water, in which had been agitated a few drops of fixed oil with a tube. The resin of the myrrhoid is not soluble in ether.

Direct treatment of the Myrrhoid by Ether.

The myrrhoid was exhausted by three successive decoctions in alcohol, previously reduced to fine powder. The hot solutions, filtered and placed in a flask, allowed nothing to deposit by cooling; united and evaporated by a moderate heat, they left, as a residuum, a yellow substance of the consistence of turpentine, transparent, extremely acrid and bitter; when hot, it was so ductile that, if a rod was just placed in it, it could be drawn out like melted glass. A small mass of six centigrammes could thus afford a thread more than two metres in length. Brought in contact with the flame of a candle, it melted without taking fire—without smoking like the resins, and finished by becoming black.

This substance, obtained by alcohol, is very bitter, but this bitterness is essentially different from that of myrrh; to it succeeds an acrid taste, which for a long time remains in the

throat. It is very soluble in cold water without residue, and in alcohol and ether.

It is the same matter which, in the treatment by water, we designated under the name of myrrhoidine.

Treatment, by water, of the residuum of the myrrhoid insoluble in boiling alcohol.

The portion of the myrrhoid, which had not been acted upon by alcohol, was heated to ebullition with a sufficient quantity of water: it was equally soluble in a small quantity of cold water. The solution was still further diluted to separate some portions of ligneous matter, or sand, foreign to its composition. This solution being evaporated, left a residuum, which had the flat taste of gum, without any after bitter taste or acridity.

In equal weight, the mucilage which it formed with water, was a little less consistent than that of gum Arabic. But if it be recollected that when gum Arabic is dissolved and dried, according to Berzelius, it retains seventeen per cent. of water, it will be seen that the two mucilages are nearly the same.

M. Pelletier has seen, under the same circumstances, the gum of myrrh produce a mucilage thicker than that of gum Arabic. The gum of the myrrhoid renders the fixed oils equally as miscible as gum Arabic.

When the myrrhoid is treated directly with boiling absolute alcohol, so as to remove from it all that it contains soluble in this menstruum, ten per cent. of myrrhoidine is obtained—the remainder is gum.

When, on the contrary, the alcohol is made to act solely upon the portion of the myrrhoid, soluble in cold water, but seven per cent. is obtained, and this ought to be the $\frac{3}{100}$, having been separated by water. Hence it follows, that the dried product of the aqueous solution of the myrrhoid is a definite combination, composed of seven parts of myrrhoidine and ninety-three parts of gum; and that the natural myrrhoid, when entire, is composed of

Myrrhoidine,	10
Gum, about	88
Tragacanthine, or foreign matter,	2

Action of Ether on the Myrrhoid.

The powder of this substance having been agitated with cold ether, was decanted at the termination of an hour; this ether, when evaporated by the atmosphere, left an oleaginous matter, staining paper like oil, and remaining when exposed to heat, but not extending itself. The paper became dry, as if it had been impregnated with a resin. It was evident that this matter was neither resin or fixed oil, for it adhered to the fingers when the capsule was heated and dissolved completely in cold water without losing its transparency. It dissolved with equal facility in alcohol, and this solution was not rendered cloudy by the addition of water in any proportion. I know of no oil or resin which possesses these properties. It is still, in this case, the myrrhoidine which was dissolved by the ether.

Myrrhoidine.

Myrrhoidine has the appearance of gum Arabic; its taste is bitter and acrid. It dissolves in water as easily as the purest gum, and is also equally soluble in alcohol and ether. It enters easily into fusion. Unsized paper plunged into it is stained as if by a resin; spread upon sized paper, it communicates the brilliancy of the handsomest varnish.

Myrrhoidine is extremely soluble in the essence of turpentine. Olive oil, cold or heated, has no action upon it: in the latter it melts, and becomes adherent to the tube with which an attempt is made to incorporate it. It can be ascertained that the oil retains none of it in solution, by dropping the oil after it has become cold, or treating it with ether after it has been decanted.

The aqueous solution alters the color neither of litmus paper or turmeric.

The subacetate of lead,
The nitrate of silver,
The Hydrochlorate of tin,
The sulphate of copper,
} do not affect it.

The sulphate of iron renders it slightly cloudy.

With the tincture of galls it is clouded, whitened, and forms a white precipitate, soluble in an excess of alcohol.

With the solution of pure tannin there are the same results.

Myrrhoidine dissolves completely in liquid caustic potassa; the solution, when saturated with nitric acid, becomes green and transparent.

Ammonia has the same effect as potassa.

If cold muriatic acid is made to act upon the dry bitter matter, in proportion as the solution takes place the acid assumes the pale yellow color of Malaga wine, and soon passes to brown; a peculiar aromatic odor is disengaged.

The addition of water to this solution, precipitates the myrrhoidine from it, under the form of glutiniform filaments. This deposit, washed, to separate from it the excess of acid, loses nothing of its bitter and acrid taste; its solubility in water is considerably diminished. This substance dissolves as before, in absolute alcohol, but as it has lost some of its affinity for water, the alcoholic tincture is clouded by water, precisely as a resinous tincture is troubled, or the essences.

Pure concentrated sulphuric acid, poured upon myrrhoidine in powder, produces solution without the disengagement of sulphurous acid; this solution has exactly the same color as black balsam of Peru. Mixed with water, it renders it cloudy, passing to a dirty white, and deposits soon after light flocks of the same color. Nitric acid dissolves myrrhoidine when cold, without disengaging nitric oxide. The solution, of a light yellow color, is rendered cloudy by the addition of a small quantity of water. When more diluted it becomes limpid.

Soda, potassa and ammonia, either in the caustic state, or that of a carbonate, produces no appreciable effect.

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ART. LXVI.—NOTE UPON THE MEDICAL NATURAL HISTORY OF A CONCRETE JUICE COMING FROM BRAZIL, UNDER THE NAME OF GUARANA.

As the utility of this substance, as a tonic, has been stated anew, and as it also contains *caseine*, we are induced to make known its origin more particularly than has yet been done. In fact, it was in the first instance announced in the year 1817, and described by Cadet Gassicourt,* without his pointing out the plant by which it was produced. The learned Bavarian botanist, Von Martius, did not determine this until the year 1826. Theod. Martius, the younger, made an analysis of the juice or extract, and determined the presence of *Guarania;*† a bitter principle without alkaloid properties. Trommsdorff, who examined it also, in 1831, supposed this guaranine to be similar to caryophylline. It has no more effect than the latter upon animals to whom it is exhibited.

The name Guarana does not belong to the plant from which this product is derived, but rather to the half savage people who extract it, and employ it themselves as a necessary digestive for their diet, which is entirely vegetable. Travellers have found the greater portion of the tribe of the Guaranis dispersed between the rivers Parana and Uruguay, in those marshy countries of Buenos Ayres and Paraguay, which lie between 29 and 30 South Latitude, living solely upon manioc, ignames, and corn. They are very weak, pale, indolent and depressed, although of tall stature, yet lank.

On this account, it is that these Indians became easily sub-

* Journal de Pharmacie.

† Chimie de Berzelius, tome v., p. 189.—*Fr. Trans.*

jected to the missions of the Jesuits and others, without having recourse to arms, and converts to Catholicism; whilst the more carniverous races, possessed of horses, to the present time have remained ferocious and untameable.

It is easily comprehended, then, that the Guaranis are under the necessity of uniting a tonic with their daily food. They unite the *guarana*, therefore, constantly either with the fecula of the manioc, or with chocolate; they also mix it with their sugary drinks, &c., for the cure of dysentery or diarrhœas, to which they are exposed by their too debilitating nourishment.

The tribe of *Maubes* or *Mauhés* especially, in the province of Para, or of Tapajoz, near the river Maragnon, (Upper Amazon,) near the city of Topinambarana, prepare a large quantity of guarana. The shrub which affords it forms a *cipo;* a vine-like thicket; the stem climbing; the leaves winged. The seeds are collected in October and November, contained in the capsules, which must be exposed to the sun in order to open. These seeds are covered with an arillus of a flesh color, which is separated by simple pressure. The pellicles, when separated and dried, furnish a rich coloring matter for dying the teeth.*

Martius has classed this twining shrub under the name of *Paullinia sorbilis*, (on account of its employment in drink,) in the Class Octandria, order Trigynia, of Linnæus, and in the family of Sapindaceæ, of Jussieu.

The calyx has five sepals; the corolla four petals; each capsule is trilocular, with three coriaceous valves. The seeds are without albumen, almost corneous, lenticular, and embossed; their perisperm is of an ashen gray color, of a bitter taste, not disagreeable, and a little oily; the membranous arillus detaches itself by desiccation. There is found in the Peruvian forests another Paullinia, the arillus of which is more succulent and nutritive, (*Semarillaria subrotunda*, Ruiz and

*Extract from the manual of Brazilian Agriculture of C. A. Taunay, Rio Janeiro, 1839, by the Honorable Lemaine Lisancourt, of the Academy of Medicine, a work recently cited of Brazil, by the Botanist Guillemin.

Payon;) other Indian Sapindaceæ have excellent fruit, (*Euphoria, Dimocarpus, Nephelium*, &c.) It would be interesting to ascertain if their seeds contain *cafeine*, although this family has no botanical relations with that of the Coffeaceæ or Rubiaceæ. The true species of Paullinia and Serjania are American.

To prepare the guarana, the cleansed seeds are pounded in a mortar, they are then roasted upon an earthen plate, as cacao. The powder thus obtained, is moistened with water, and left during a night. The seeds of the Paullinia, coarsely bruised, are also mixed with it. This soft mass is made into cylinders or cakes pointed at both ends, eight inches long, or formed into boluses or loaves, with a neck, weighing a pound or more. These are dried in the sun, and better still by the smoke of a fire, suspended to the roofs of the huts of these people. In this way they harden and become black. The internal portion also becomes brown with time, as I have seen in numerous specimens.*

The guarana can be preserved for several years; the Guaranis envelope them in the leaves of the Scitamineæ, (Maranta, Canna, &c.,) and preserve them in baskets without their altering, when kept from moisture. The specific weight is 1.294 to 1.355; it swells and softens in water, which dissolves a part of it. The blackish-brown color of the guarana, its odor and taste, present some resemblance to the paste of the cacao, but without being oily. The acerb taste resembles that of rhatany, but with feeble bitterness. The fracture is conchoidal, cleft by the retraction of the parts, with brilliant fragments, which are blackish and prominent, by the side of irregular cavities.

The Indians rasp, in their journeys, the guarana, which they constantly take with them, by means of the rough bone of a large fresh water fish, *Sudis gigas* (the *vastres* of Cuvier.) This they unite with sugar and water, and the drink is antifebrile and refreshing.

* I am much indebted to M. Dechastelus, pharmacien of Paris, who has received this substance from Brazil in large quantities.

Guarana renders chocolate more tonic and strengthening, without sensibly altering its taste. The roots of this Paullinia are equally reported to be febrifuge.

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ART. LXVII.—ORGANIZATION OF MEDICINE AND PHARMACY IN RUSSIA.

A ukase, confirmed by the Emperor, December 28th, 1838, and promulgated by direction of the Senate, January 25, 1839, regulates in Russia everything in which the medical profession is interested. This regulation having been translated, and published in Germany by M. Ed. Siller, in the Repertory of Pharmacy of Buchner, we have been led to suppose that it would be well received, if the principal features of it were made known, particularly those portions which relate to pharmacy.

Let us in the first place remark, that in Russia, pharmaceutists are considered in the employ of the government, a circumstance which confers upon them great importance in the social hierarchy.

The examinations of medical practitioners, veterinary surgeons, and pharmaciens, and in general of all persons who exercise any department of the medical profession, are made by the Academies or Imperial Universities of Medicine and Surgery.

The examination takes place in full meeting of conference, or Faculty of Medicine.

Each Professor is the examiner upon the portion of science that he professes. He can be substituted for by an adjunct. In the absence of both, the faculty designates another person to perform the office. At the same time, each Professor present has the right of propounding questions upon all the subjects of the examination.

No person, whether a Russian subject or a foreigner, can practice either medicine, veterinary surgery, or pharmacy, without being provided with a diploma, emanating from an Academy or Imperial University of Medicine or Surgery.

There are three degrees of examination relative to pharmacy, to wit:

1. That of Assistant Pharmacien. *(Pharmacopœus Auxiliarius.)*

2. That of Provisor, (Purveyor.) *(Pharmacopœus substitutus.)*

3. That of Pharmacien. *(Pharmacopœus.)*

Physicians, veterinary surgeons, assistant pharmaciens and provisors, are divided into two orders, relatively to the extent of their acquirements, and do not pass from one order to the other without new examinations.

Title 1*st.* To be admitted to an examination for assistant pharmacien, it is necessary, 1st. To be prepared with sufficient knowledge upon the subjects which constitute the objects of instruction for the four first classes in the Colleges.—2d. To have served an apprenticeship of three years at least in a pharmacy of the crown, or in a free pharmacy.

The examinations are upon the following subjects:

a. In *Mineralogy*, the principal systems, the terminology, and principally the minerals which belong to pharmacy.

b. In *Botany*, the terminology and the principal systems.

c. In *Zoology*, the different systems, and principally the animals of which certain parts are employed in pharmacy.

d. In *Physics*, the general properties of bodies.

e. In *Chemistry*, the simple non-metallic bodies, the metals, the principal oxides, acids, salts and products, employed in medicine.

f. In *Pharmacognosy*, the substances most employed, their denomination, their origin, their distinctive characters.

g. In *Pharmacy general*, it is necessary to translate from the Latin Pharmacopœia, a passage pointed out by a Professor.

h. In *Pharmacology*, to indicate the ordinary doses of medicines of violent activity.

Finally, the candidate must give proof of practical information, by executing, under the eye of the examiner, four preparations assigned to him.

Title 2. The assistant pharmacien who wishes to obtain the grade of provisor, if he be of the first order, must remain two years longer, and three years if he be of the second order, in a shop of the crown, or a free shop. He must moreover, prove by certificate that he has followed in an Academy or University, a complete course of each of the sciences upon which the examinations are made.

The examinations refer to the same sciences as the preceding, but are pushed still further,

The candidate for the degree of provisor, must in addition have applied the principal remedies in cases which required immediate interference, and which are designated in an especial rule.

The theoretic examination being terminated, the candidate makes two pharmaceutical preparations and executes two chemical operations, under the inspection of the examiner.

Title 3. To be admitted to the grade of pharmacien, it is necessary, 1. To possess the grade of provisor; 2. To have practised in this capacity for two or three years, according to order, or to have kept a shop for the same space of time.

The examinations are upon the same subjects as the preceding; but a more extensive knowledge is required of the candidate, both in theory and practice. There must be evinced the capacity of executing different researches, or chemical analysis, and it must be proved that there is possessed the knowledge of book keeping and the commercial information requisite to keep an establishment. Finally, as a last test, three of the most important pharmaceutical preparations must be made, always under the inspection of one of the examiners. Provisors of the first order, distinguished by the good administration of a shop, or who have published works on pharmacy, chemistry, or natural sciences, honorably received by the scientific world, may obtain the degree of pharmacien without being subjected to examination.

By a general edict, it is prohibited pharmaciens from writing prescriptions and interfering with the treatment of patients, except in cases of danger to life, such as poisoning, fainting, hemorrhages, burns, &c., when immediate aid is needed, and a physician is expected.

This regulation, which comprises the most judicious measures, is a new proof of the importance that, among the nations of the North, is attached to the profession of pharmacy. It may be added, that if the preceding arrangements demand of the Russian apothecary the fullest guarantee of knowledge, they at the same time secure to him the price worthy of his services, a distinguished place in the social circle, and the consideration which should be the object of ambition to every one who exercises a liberal profession.

P. A. C.

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MISCELLANY.

Kiesteine.—M. Nauche has given this name to a particular product of a gelatino-albuminous nature, which is found in the urine of women at the end of the first month of pregnancy. This principle is separated by repose alone, from the other matters of the urine. It is sufficient to place this fluid in a glass; at the end of several hours the kiesteine shows itself upon the surface, under the form of points of oblong filaments, which unite in a layer a line in thickness. A portion of this layer is precipitated to the bottom of the vessel, and there forms a white deposit, of a milky appearance. Another remains upon the surface of the urine, contracts adhesions with the sides of the vessel, and is converted into a solid membraniform substance.

The kiesteine furnishes a positive means of detecting pregnancy, even at its commencement, when the woman is in health. In diseases with purulent secretion, in the different dropsies, diabetes, in children with worms, the urine is often covered with an albuminous, fatty, or saline layer, which has some resemblance to that observed in pregnancy, but, with a little practice, they are distinguished at the first glance. The existence of these diseases ought, moreover, to put us upon our guard against all mistakes of this kind.

M. Nauche assures us, that he has frequently employed this method of determining pregnancy, in the case where it was far from being expected. He thinks that kiesteine is also found in animals under the same circumstances.

Emanuel Russeau has undertaken, at the *Garden of Plants*, experiments upon the same subject. He has found the same substance as M. Nauche in the urine of Apes during gestation. He has in vain sought for it in those who were not fecund—or in the urine of males.

Journ. de Chemie Med.

Upon Ligustrine, and the constituent parts of the Bark of the Ligustrum vulgare. By M. G. Potex.—In the bark of the Ligustrum vulgare I have discovered a peculiar substance. The following is the method of preparing it: The bark, well bruised, is boiled in pure alcohol, it is then distilled and the residue filtered, and made to undergo fermentation by means of yeast, to destroy the sugary matter. After this, it is filtered a

second time, and precipitated with milk of lime, to decompose the soluble magnesian salts. The precipitate is collected, the lime separated by sulphuric acid, avoiding an excess of acid, the liquid is evaporated to separate the sulphate of lime; the last traces of lime are removed by oxalic acid; the free acids, and the extractive matter, by neutral acetate of lead; and the surplus of this last removed by treating the filtered liquid with a current of sulphuretted hydrogen gas. Evaporation is next performed to remove the acetic acid, the extract is redissolved in a small quantity of alcohol, and the mannite is separated by crystallization. The extractiform residue is dissolved several times in cold strong alcohol to separate the remainder of the mucuso-sugary matter; finally it is allowed to evaporate.

The ligustrine is a yellow extractiform mass, bitter, hygroscopic, and retaining traces of acetic acid and mucoso-sugary substance. It is soluble in alcohol and water, but insoluble in ether and absolute alcohol. The metallic salts and the alkalies form no precipitate with it; with sulphuric acid there is obtained a superb azure color. When the solution is concentrated, the color is a deep indigo blue. By diluted sulphuric acid, these changes of color are not produced.

The constituent parts of Ligustrum vulgare are—ligustrine, mannite, fermentable sugar, muco-sugary matter, amylum, chlorophylle, bitter extractive, bitter resinous matter, tannin, albumen, salts principally with magnesia as a base, lignin.

Employment of Hydrated Peroxide of Iron as an antidote for Scheele's green. By Dr. Spaeth, of Esslingen.—An infant, three years old, having swallowed a spoonful of Scheele's green, (arsenite of copper,) very soon became attacked with violent vomiting, diarrhœa, violent pain in the belly, and insatiable thirst. He was in the first instance made to drink cold water, and then fifteen grammes of the peroxide of iron where administered to him, suspended in hot water. He took four doses of it. An hour after the employment of the antidote, both the vomiting and the diarrhœa had ceased, as well as the pain and the thirst; the next day all the symptoms of poisoning had ceased.

Gazette Medicale.

The Indian mode of preparing the Perfumed Oils of Jasmine and Bela.—Dr. Jackson, of Ghazeepore, in a letter to the editors of the Asiatic Journal of Calcutta, for June, 1839, says:—In my last communication on the subject of rose water, I informed you that the natives here were in the habit of extracting the scent from some of the highly smelling flowers, such as the jasmine, &c.; and that I would procure you a sample, and give you some account of the manner in which it is obtained. By the present steamer, I have despatched two small phials, containing some of the oil

procured from the Jasmine and Bela flower. For this purpose the natives never make use of distillation, but extract the essence by causing it to be absorbed by some of the purest oleaginous seeds, and then expressing these in a common mill, when the oil given out has all the scent of the flower which has been made use of. The plan adopted, is to place on the ground a layer of the flower, about four inches thick, and two feet square; over this they put some of the Tel or Sesamum seed, wetted, about two inches thick, and two feet square; on this again is placed another layer of flowers, about four inches thick, as in the first instance; the whole is then covered with a sheet, which is held down by weights at the ends and sides. In this state it is allowed to remain from twelve to eighteen hours; after this the flowers are removed, and other layers placed in the same way; this is also a third time repeated, if it be required to have the scent very strong. After the last process, the seeds are taken up in their swollen state and placed in a mill; the oil is then expressed, and possesses most fully the scent of the flower. The oil is kept in prepared skins, called dubbers, and is sold at so much per seer. The Jasmine and Bela (Jasminum Zamba) are the two flowers from which the natives in this district produce their scented oil; the Chumbul (Jasminum grandiflorum) is another, but I have been unable to procure any of this. The season for the manufacture is coming on. The present oils were manufactured a year ago, and do not possess the powerful scent of that which has been recently prepared. Distillation is never made use of for this purpose, as it is with the roses, for the extreme heat (from its being in the middle of the rains when the trees come into flower,) would most likely carry off most of the scent. The Jasmine, or Chymbele, as it is called, is used very largely among the women; the hair of the head and the body being daily smeared with some of it. The specimen that I send you costs at the rate of two rupees per seer.

Edin. New Phil. Journ.

Oil of Ergot—the Mode of Preparing it—its Physical and Chemical Properties.—Mr. Samuel Wright gives the following process as a convenient one for preparing the oil of ergot for ordinary purposes:—Digest the ergot in liq. potass. at a temperature of 120°–150°, until a perfect saponaceous solution be formed. The liquid is then to be diluted with half its weight of water, exactly neutralized with sulphuric acid, and submitted to distillation from a saline or an oil bath. The product is white, adhesive, and fatty-looking, almost free from empyreuma, and nearly tasteless.

The readiest and best, though unfortunately, the most expensive way of obtaining this oil, is, he says, by percolating ergot in a state of fine powder, with sulphuric ether. By allowing the ether to evaporate spontaneously, the oil of ergot is left in its purest form.

As thus prepared, he adds, it usually consists of two portions—the one,

colorless and translucent, the other, having a reddish-brown hue. The latter character is an acquired one, and simply dependent upon the age of the ergot. In old specimens, the oil is colored throughout, and often deeply; in recent ones, on the contrary, it is not unfrequently entirely free from color.

Its taste is oily, and slightly acrid, its odor is similar to that of ergot, though more agreeable, and neither heightened by acetic acid, nor destroyed by long contact with a clear plate of copper or of iron. When heated, it blackens rapidly, acquires a disgusting empyreumatic odor, like that of an old tobacco pipe, and an acrid biting taste. If the heat be long continued, complete volatilization takes place; but if the oil be suffered to cool, it thickens, solidifies slowly, and ultimately becomes resinous.

By long exposure to light and air, at a moderate temperature, it assumes a reddish-brown color, though it is little altered in either smell or flavor. The purple hue of ergot appears to be owing to the action of light and air upon the oil, aided by the free phosphoric acid. By mixing the colorless oil with flour and a little acid, and exposing the mass to air and sunshine for some weeks, I have succeeded in producing the distinct color of ordinary ergot. It will be remembered that the latter, when growing, is never darkened so long as it is completely shielded by the glume.

Oil of ergot is of less specific gravity than water, and when these are agitated together, the latter becomes slightly odorous, and the former is rendered somewhat opaque. It is soluble in all the ethers, alcohol, naphtha, and bisulphuret of carbon, from which it is imperfectly separated on the addition of water. It is dissolved by all the essential oils, and mixes intimately with some of the fixed ones, particularly almond and olive oil. It is likewise soluble in kreosote, caustic alkalies, earths, and ammonia. With the latter substances, it forms a soapy solution, from which it may be separated by an acid. Sulphuric, nitric, and hydrochloric acids in the dilute form, have little action upon it, but, when concentrated, they convert it into a deep brown or black mass. When long exposed to light and air, at a moderate temperature, the oil thickens, deepens in hue, and diminishes in strength; yet, if kept in a stoppered bottle, it is patient of preservation, and will retain its activity for years. On this account, as also from the fact of its embodying all the active properties of ergot in a safe and manageable form, Dr. W. is persuaded it will be found a much more advantageous officinal preparation than the crude drug.

Am. Journ. Med. Sci., from Edin. Med. and Surg. Journ., July, 1840.

On the Hydrocyanoferrate of Quinine.—Notwithstanding the valuable febrifuge virtues of the sulphate of quinine, it is well known that it occasionally fails. In such cases the hydrocyanate of quinine has been used

with good effects. But as this is a salt subject to decomposition, Signor Bertozzi of Cremona, has proposed to substitute the hydrocyanoferrate of quinine, the powers of which over the worst forms of intermittent fever have been completely established.

Dr. Zaccarelli has prescribed this new medicine in a great number of cases in place of sulphate of quinine. It is found to cut short tertian and quartan fevers; and, what is well worthy of the attention of physicians, it has principally succeeded in cases where the sulphate of quinine has failed. Dr. Carioli has also confirmed the febrifuge properties of this preparation.

The following is given by Bertozzi as the most economical process for obtaining it. One part of sulphate of quinine is to be triturated in a glass mortar to an impalpable powder; a part and a half of the ferro-prussiate of potash, previously dissolved in six or seven parts of distilled water, is to be mixed by careful agitation, and the whole exposed in a flask to heat, stirring the mixture carefully until it arrives at the boiling point. In proportion as the liquid becomes transparent, there is precipitated to the bottom and sides of the flask a substance of a greenish-yellow color, having an oily consistence. Having poured off the liquid portion, this substance is to be washed with distilled water, and then dissolved in very pure alcohol at 100° Fahr., and immediately filtered. On evaporating the alcohol, a mass, confusedly crystallized in needles, is left, the weight of which amounts to three-fourths of the sulphate of quinine used. This is the hydrocyanoferrate of quinine.

When in small fragments this substance is of a pea-green color, and of an intensely bitter taste. It dissolves in cold, but better in hot alcohol, and is precipitated from its solution almost entirely by water. It is decomposed by sulphuric acid, and by the tincture, infusion, and decoction of cinchona. It has been given in doses of three grains and a half, repeated as occasion required.

Ibid., from Dublin Journ. Med. Sci. July, 1840.

Tonic Astringent Pills of Walch.—The following is the formula for these pills:—℞. Terebinth, Venet. Extr. Gentian. *aa* ʒij; Ferri Sulphat. Kino *aa* ʒiss. M. To be made into pills of a grain and a half each. These pills are said to be very efficacious in the cure of gonorrhœa and of chronic leucorrhœa. The dose is four pills three or four times a day.

Ibid., from Journ. des Connaiss. Méd. Prat. et de Pharm., June, 1840.

Action of Albumen on Corrosive Sublimate.—The change induced by albumen on corrosive sublimate when taken internally, is one of the most interesting problems in chemistry. It is universally considered as an antidote if taken sufficiently early, but how it acts seems at present to be a matter in doubt. I believe Dr. Bostock was one of the first who noticed

the action of these bodies on each other, and he states explicitly, that even when heat was applied, the precipitate is a compound of albumen and corrosive sublimate. (*Nicholson's Journal*, vol. xiv. p. 142.) Dr. John Davy, to whom I am indebted for this reference, advocates a similar opinion in his Physiological and Anatomical Researches. According to his experiments, no muriatic acid was disengaged or produced, nor could he induce a union of albumen with either the protoxide or peroxide of mercury. It has, however, been generally credited on the authority of Orfila, that a decomposition takes place, and that the resulting compound consists of albumen, muriatic acid and calomel. He grants, however, in the third edition of his Leçons, (vol. i. p. 301,) that the resulting calomel is never applied in the form of powder to the membranes of the alimentary canal, nor has it the physical properties of calomel, since it is intimately combined with the substance which has been the cause of its formation, and thus constitutes a ternary chemical compound. I have also mentioned, in another place, the cases of Olivier and Barruel, who, in persons poisoned with corrosive sublimate and to whom milk and albumen had been administered as antidotes, could detect no calomel; but the tests indicated the presence of corrosive sublimate, a portion of which was probably still undecomposed.

Dr. Turner (Chemistry, 5th edit., p. 937,) also states, that Rose, in a late analysis, proved the resulting precipitate to consist of oxide of mercury and albumen.

The latest experimenter is Lassaigne. He asserts, from a series of observations, that in the action of albumen on metallic salts, *this principle unites directly with these compounds without producing any decomposition.* It forms compounds with them, which are insoluble in water, when these bodies are in certain proportions, but susceptible of solution when the albumen or the metallic salt is in excess. And these compounds he denominates *albuminates.* (*American Journal of Pharmacy*, vol. xii. p. 170, from the *Journal de Chimie Medicale.*)

We have reason to fear, from these results, that the value of albumen, as a *chemical* antidote, will be somewhat impaired. Still its use should not by any means be omitted, but it should be administered as early as possible and in large quantities. T. R. B.

American Journ. Med. Sciences.